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ABSTRACT

Included are summaries of the current national and international literature related to science and public policy. The summaries are grouped into these topical categories: General; Science, Domestic Problems and National Goals; Needs and Allocation of Resources for Science; National R & D Programs; Science, Education and the University; Science, Management and Policy-Making Bodies; Science, Foreign Affairs and National Defense; Multinational Science Policy; and Science Policy Abroad. (PR)

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Battelle Memorial Institute

Science Policy Bulletin

Volume 3 • Number 5 • October 1970

Science Policy Bulletin reports the current national and international literature in the area of science and public policy, encompassing both "policy for science" and "science for policy" matters. For brevity, the word "Science" in the title of the Bulletin is used to denote engineering and technology as well as science.

The Bulletin is intended for individuals and organizations engaged in studying, formulating, or implementing public policy relating to science and its applications. The Bulletin consists principally of summaries of the cited literature. These précis are grouped in selected topical categories; cross-indexing is not used.

The literature reported by the Bulletin includes books, reports, and periodical articles. The regularly screened periodicals are listed on the inside back cover. The focus of the literature reported is on matters of broad public policy; literature of a highly technical and narrowly specialized nature is not included.

Science Policy Bulletin

Volume 3 • Number 5 • October 1970

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ABOUT THIS ISSUE

"Early November" (as promised last issue) is perhaps like beauty – in the eyes of the beholder! Nonetheless, with this issue, we have further closed the gap between plan and reality. Volume 3 should be history in January, 1971.

In acknowledgment of the fact that the Bulletin is not a "one-man show", the names of two staffers – new to our readers but not to our production effort – now appear in our masthead. Marjory Grieser has labored in the Bulletin vineyards since the publication's inception. Where earlier we shared her talents, they are now fully devoted to the Bulletin. Judy Pennington is the recipient of either kudos or curses – depending on the accuracy and completeness of our mailing list!

With this issue – and in keeping with reader suggestions – Section 8000, "International Science Policy", has been divided. The result is Section 8000, "Multinational Science Policy", and Section 9000, "Science Policy Abroad". / CRT

1000 GENERAL

1040. Peccei, A., "The Club of Rome and the Predicament of Mankind", *Science Policy News*, v. 2, no. 2, September 1970, pp. 13-14. By invitation of the Swiss Federal Council, the Club of Rome and a conference of Swiss political, scientific, and industrial notables met in Berne on June 29 and 30. The Club of Rome comprises some 50 scientists, planners, intellectuals, and industrials from Asia, Africa, Western Europe, and North and Latin America, and is concerned with global problems of the techno-scientific society. The "action-oriented" Club of Rome "believes it is still possible . . . to meet this unprecedented tangle of problems before it outstrips our capacity for control". The Club's first objective is "to acquire and spread an in-depth understanding of the present critical state of human affairs, and of the narrowing and uncertain perspectives and options which are likely for the future, if present trends are not corrected. The second objective is, then, to recognize and propose new policy guidelines and patterns of action capable of redressing the situation and keeping it under control." The Club feels there is an urgent necessity for a "Copernican change" in attitude to shift from a fragmented viewpoint to a systematic viewpoint. Solutions to local or short-term problems must be considered irrelevant unless they are also solutions to global and long-term problems. "Application for incorporation of the Club of Rome was made last June in Geneva as a non-profit, private association under the Swiss Civil Code. Its secretariat is in Rome and its first two offices are c/o The Battelle Institute, Geneva, and c/o the Japan Techno-Economics Society, Tokyo."

1041. Wren-Lewis, J., "Man for Systems or Systems for Man?", *New Scientist*, v. 48, no. 724, 22 October 1970, pp. 182-183. "This Runaway World – Can Man Gain Control?" was the theme of a conference sponsored by the Pierre Teilhard de Chardin Association of Great Britain and Ireland. Of special interest were talks by the following speakers: (1) Dr. Zador Tordai of the Budapest Academy of Science, who suggested that revolutionary changes in the social structure are needed to cope with the problems of population, pollution, and expanding technology; (2) Dr. Joel deRosnay, Chemist, MIT, who described basic principles of cybernetics in relation to biochemical systems and presented "a vivid picture of how computers might be used to turn complex human societies into self-regulating systems capable of maintaining continuous ecological balance with the environment and of making 'real time' adjustment to changes coming both from without and from within"; and (3) Dr. Stafford Beer, visiting professor of cybernetics (Manchester) and visiting professor of general systems (Open University), who demonstrated how population increase and "massive interaction" made possible by

technology produces complexities that present management techniques are unable to cope with, except by repression and regimentation, and who also described techniques to be applied in design of future computer systems and hardware. Some aspects of computer control were questioned and discussed. In addition to problems of the necessity of control, the necessity for simplification of needs as a means of restoring natural balance was mentioned.

1042. Todd, Lord, of Trumpington, "A Time to Think", *Advancement of Science,* v. 27, no. 131, September 1970, pp. 1-6. The slow pace of social progress relative to the rate of technological advance is discussed. In view of the importance of science and technology to economic strength and national stability, the author proposes that the root of the problem is educational. He notes that "while science and technology have been bringing about vast changes in our material existence at an . . . increasing pace, we have failed to match them with appropriate social and educational changes". He also observes that the general public has little background in science, and that "it is hard to believe that correct policy decisions can be reached in a democracy whose members are ignorant of science". It is proposed that science should not be treated as a specialty, but as a part of general culture, and that we need fewer scientists and technologists and more technicians for the practical aspects of science. Also, according to Lord Todd, the university system should not be enlarged along traditional lines; instead, it should be reoriented to deemphasize the highly trained science specialist.

1043. Eggers, A. J., Jr., "Interactions of Technology and Society", *Astronautics and Aeronautics,* v. 8, no. 10, October 1970, pp. 38-50. This article dramatizes the profound mutual influences between technology and society by illustrating how their interactions at an accelerating pace throughout history have brought the earth and its peoples to their present state. The vastly increased mobility of society is cited as a large-scale effect of technology, with consequences in the form of greatly increased numbers of international conferences, mushrooming world tourism, and (on the negative side) capability for major conflict. Other effects of technology discussed are the increased life-span and leisure time of man in developed societies, his increasing use of materials and energy, and his high rate of waste production. The author calls attention to the growing disparity between the lot of peoples in societies that have not applied technology and those that have. Since the former constitute a majority of the world's population, their dependency on the developed nations may well increase to major proportions if current trends continue. "The application of new technologies changes life styles, and the more rapid this rate of application, the more rapid the rate of change of life styles." However, the author points out that

this cannot go on indefinitely, since there is a limit to the rate at which humans can adapt. Consequently, indefinite exponential projections into the future of such things as energy use, materials consumption, waste production, and population growth are unrealistic. An equilibrium must be reached eventually, and the author indicates that we are already applying technology toward finding the desired equilibrium (e.g., antipollution legislation, noise-control regulations, improved agricultural practices, population-control measures, arms-control negotiations). He speculates on whether modern techniques of gas dynamics might be applicable to problems of social dynamics, and whether our control technology might be used to direct "governmental processes for dealing with our increasingly nonlinear social systems".

1044. "Technology, Man, and Nature", *Congressional Record,* v. 116, no. 167, 24 September 1970, pp. S16435-S16436. This is a reprint of the concluding statement of a conference on Technology: Social Goals and Cultural Options, sponsored by the Aspen Institute for Humanistic Studies and the International Association for Cultural Freedom. The purpose of the conference was "to consider how societies can make better use of modern technology for the needs of man". Following are some of the observations expressed: (1) "the need is not for the slower development of technology . . .[but] rather for more thoughtful and careful application of new technologies to prevent both long-range damage to the earth and violence to human values and to foster social, economic, and cultural development"; (2) "advanced and developing societies must both aim at increasing the transfer of technology and technological capability to the developing nations"; (3) "only by the control of population growth can societies hope to share the potential benefits of technology"; (4) "fuller use must be made of institutions . . . which . . . serve to bring individuals in touch with government . . . [to assess] the opportunities and the dangers of new technological developments"; and (5) society must "devise means by which individuals can participate fully and equitably in the making of decisions . . . about the proper exploitation of technology".

1045. Blume, S. S., "Science Policy and Science Policy Research", *Nature,* v. 228, no. 5268, 17 October 1970, pp. 215-218. The author cites a definition of science policy from the first Report of the U.K. Council for Scientific Policy, before discussing duties of the science policy maker. Important factors that shape national science policies are listed and discussed briefly: (1) a formally constituted science advisory body or science academy, (2) the interest, background, and constitutional limitations of legislative bodies, (3) concern of the wider community, scientific, and general population, and (4) the influence of statistics and of the researcher who manipulates the

statistics. Policy research can have both critical and instrumental functions. "It can clarify the options of the policy maker . . ., but it should be able to clarify and critize the fundamental assumptions . . . on which policy making is based." The growth of science policy research in private research organizations and academic institutions is discussed, and in view of the "instrumental" qualification given, research in both private organizations and academic institutions suffers from not being tied to the decision-making structure. The author concludes that if critical policy research is to be influential, "a good deal of thought must be given both to its organization and to ways in which it might be applied".

1046. Siekevitz, P., "Scientific Responsibility", *Nature,* v. 227, no. 5265, 26 September 1970, pp. 1301-1303. In the author's opinion, the professional standards of scientists should be revised to include a standard of responsibility as well as research and teaching capabilities. This standard may be easy to apply in some cases (rejection of scientists who use their skills to kill men), but is difficult to apply in borderline cases in which consequences of a scientific advance are not easily foreseen. The "special responsibility" of a scientist should be to keep the general public informed on scientific and technological matters. Furthermore, regardless of scientists' intentions, research is already being redirected "to cure the ills of technological gain . . . All told, basic research will almost disappear from the Washington science scene", and there is danger that scientists will be left out of the process of formulating goals and policies. The author is skeptical about technological-assessment studies, "for they tend to end up as studies of risk assessment". So far, technological advance has been based on "chance and market economies, and is thus quite out of keeping with the methodology of the scientific experiment" which produced it. The author questions whether "further refined technology, directed though it may be, will cure past technological mistakes" and suggests that it is wrong for scientists to give the world the impression that they know much more than they do.

1047. Handler, P., "Handler on Science Policy (II): The Responsibilities are Worldwide", *News Report,* National Academy of Sciences, National Research Council, National Academy of Engineering, v. XX, no. 7, August-September 1970, pp. 10-11. The related problems of population control and management of the environment are discussed in this W.O. Atwater Memorial Lecture. The reaction against science and technology is seen as the result of some scientists' indulgence in "hyperbole" with consequent "retreat from our technological civilization". The author feels that both time and means for correcting environmental problems are currently available, as demonstrated by the case of Lake Washington, Seattle. An international organization to oversee population control, environmental quality, resource

conservation, and quality of life is proposed. The organization should "establish worldwide standards of acceptable quality for water, air, and foodstuffs and recommend international population policy", as well as study the utilization of renewable and nonrenewable resources. The emotional reaction against science "has led to the diminution in public support of the scientific endeavor", and the author believes that any resulting significant reductions in scientific research and education would have serious long-range consequences.

1048. Chain, Sir E., "Social Responsibility and the Scientist", *New Scientist,* **v. 48, no. 724, 22 October 1970, pp. 168-170.** Sir Chain holds that one of the scientist's real moral responsibilities is to keep the public informed about the progress of science and technology and "to correct erroneous and exaggerated Press statements and put the facts in proper perspective". He points out that the study of science is a description of the laws of nature and "has no moral or ethical quality", and further asserts that "the responsibility for the use and abuse of science and technology rests with society". The scientist has no right to back away from weapons or counterweapon research, especially in a war situation. The author questions the idea that explosive weapons are more "humane" than biological weapons. The scientist is seen as being responsible first to the nation to which he belongs. The need for secrecy in both military and industrial technological developments is defended. Scientists are not to be held responsible "for the obnoxious effects of their inventions; the responsibility is, again, with the society of which they form part".

1049. King, A., "Science Policy, Economic Growth and the Quality of Life", *Science Policy News,* **v. 2, no. 1, July 1970, pp. 1-6.** Dr. King, Director-General for Scientific Affairs of the Organization for Economic Cooperation and Development, defines science policy as "a deliberate and coherent attempt to provide a basis for national or international decisions influencing the size, institutional structure, resources and creativity of scientific research in relation especially to its application and public consequences". He discusses the history of science policy in institutional forms and shows the role of science in economic growth to be a vital one. In order that science may "function as an instrument of development", he believes that certain changes are necessary: (1) development of a "clear formulation of national goals", (2) adoption of "a collective statesmanship of science", (3) "assessment of the social and cultural as well as economic consequences of alternative technological developments", (4) placement of greater importance on the planning function and its methodology, and (5) modification of governmental and political structures. Other cited factors of importance include the need for a long-term view, and a need for a senior minister close to the office of the prime minister "to develop integrative and long-term policies".

Present science policy may already be too narrow and may "be showing signs of obsolescence [suggesting] that we are approaching a new conceptual phase of scientific policy."

1050. Linscott, R. B. (Ed.), "Toward a Federal Science Policy", *Optical Spectra,* v. 4, no. 8, September 1970, p. 11. Because of diminishing federal support for science, there is a "rising tide of demand from the scientific community for a more coherent and even-keeled science policy that will take some of the feast-or-famine aspects out of R & D planning, will provide a better balance between basic and applied research, and will put the government-university partnership on a new and firmer basis". The author points out that "an overly rigid federal science policy could be almost as bad as none at all"; however, "it should be possible to have consistency without rigidity. What the critics of the present policies are seeking is a firmer commitment by the federal government to the proposition that science needs and should have its generous and continuing support – not on a fluctuating basis dictated by the ups and downs of the political marketplace, but on the basis of long-range planning that will provide a reasonably steady year-in – year-out foundation for the technological growth on which the nation's future must rest."

1051. Handler, P., "Toward a National Science Policy", *BioScience,* v. 20, no. 17, 1 September 1970, pp. 971-977. This is a condensed version of testimony by the President of the National Academy of Sciences before a Congressional subcommittee last July. In it, Handler discusses the consequences of the decline of federal support of R&D. He recommends that Congress commit the government to an unequivocal science policy that includes the following tenets: (1) wise application of technology is a primary concern; (2) it is the responsibility of the federal government to develop new technologies in appropriate areas; (3) the federal government is properly the "principal patron of science and advanced science education"; and (4) Congress should strive "to sustain a national scientific endeavor of sufficient magnitude to assure the continuing intellectual and technological progress of our civilization and the avoidance of technological surprise by other nations". The speaker feels that science-based agencies doing fundamental and applied research have been successful and should continue to be funded. He believes that fundamental research should be given a more significant place in funding, and should grow at a rate commensurate with rate of growth of GNP. The federal government should have an agency to oversee the welfare of universities and university research. According to Handler, an essential component of the federal investment in research and higher education "must be a rather large-scale program of formula grants to colleges and universities, or their major subunits, to permit them to remain solvent . . . and . . . put an end to the bootlegging of support for the

academic endeavor through the back door of individual research grants and contracts". He believes that certain reforms in graduate education are necessary and makes some suggestions for bringing them about. He contends that we are not training too many scientists, and feels that if we do not continue to train these people, "we may lose our options for the future". A proposed National Youth Service Program is described, and a recommendation is made that "fundamental scientific and scholarly endeavor . . . be the responsibility of a major federal agency with commitment only to research and education," and not of "agencies with other overriding societal missions". Other "proposals for strengthening the federal apparatus for science" are noted and their shortcomings pointed out.

1052. Handler, P., "Science's Continuing Role", *BioScience,* v. 20, no. 20, 15 October 1970, pp. 1101-1106. Science-oriented issues of today's society are discussed in this speech given at the dedication of the Loeb Building, Marine Biological Laboratory, Woods Hole, Mass. On the problems of fundamental science, the author observes that there is "no acceptable formula [that] rationally relates the magnitude of federal support of research to some quantitative aspect of our society, be it population, gross national product, per capita income, overseas trade balance, mean length of hospital stay, or what have you". He believes "that we gravely need an extensive revision of the manner in which the government conducts its affairs in this area, and that we badly require a major federal agency specifically responsible for federal programs concerned with research, higher education, and advanced studies. Such an agency should plan and operate an orderly system of support, not as a haphazard patchwork, as at present, but as a continuum which provides specifically for the needs of institutions, investigators, and students. Research, scholarship, and education would be the mission of this enlarged agency; surely, the level of funding of science should not be the tertiary consequence of major swings in the funding of agencies whose primary missions include neither the strength of the scientific enterprise nor the welfare of the institutions in which it is conducted." Handler does not see the end of U.S. involvement in Vietnam, when it comes, as the beginning of a sudden surge of money for science. Rather, he believes that federal support will resume growth only if some major change is instituted in the system (such as the establishment of the proposed agency).

1053. Daddario, E. Q., "On National R & D Policy", *Astronautics & Aeronautics,* v. 8, no. 10, October 1970, pp. 56-63. In this paper, Representative Daddario, Chairman of the House Subcommittee on Science, Research and Development, delves into the utilization of scientific and engineering manpower as a central issue of national-science-policy formulation. He points out some causes and

consequences of the decline in level of Federal support for R&D and the growing public disenchantment with science and technology. A key factor cited is "our failure to make clear the important distinctions among *fundamental research, applied research,* and *technology* . . . and the sensitive couplings that must exist between these different employments of scientists and engineers". Daddario contends that the Administration's curtailment of R&D funding without considering what this does to human resources" is shortsightedness that this nation can ill afford". He deplores the fact that so few data are available about our scientific and technical manpower that decisions affecting utilization have to be "based largely on hunches, intuition, and fragmentary information". New emphasis is urged on making the most effective use of our technical-manpower resources amidst the changing national moods and needs. This implies not only working on current urgent problems and continuing basic research, but also being willing and able to shift manpower to new objectives within fields and from one field to another.

1054. "The Nation's R and D Effort", United States Army Logistics Management Center, Fort Lee, Virginia, December 1969, 24 pp. This report surveys the Federal organization for R&D and discusses the economic impact of R&D. "It has been said that the Federal government's primary objective in R&D is to develop national scientific and technological capabilities as far as possible as a prelude to continued social and economic progress. In the long run, science and technology are dependent on two factors: (a) the maintenance and augmentation of scientific knowledge through research, [and] (b) improved scientific education and advancement in competence of young scientists and engineers." The Federal Government is the largest source of R&D funds (about 66 percent), but "the development side of R&D receives double the support accorded research" since development offers more immediate rewards. The second largest source of R&D funds is industry, which "finances almost one-third of the total R&D in the country, and colleges and non-profit institutions support the remaining two to three percent". Manpower is termed a "vital ingredient of a national capability in R&D . . . Approximately 40 percent of today's scientists are primarily engaged in R&D activities, while about 30 percent of the engineers are in R&D." "Spin-off", or the application of technology derived from Federally funded R&D to other uses, is depicted as having a real (but difficult-to-measure) impact on our economy (e.g., spurring of investment in new industries based on new technologies stemming from defense R&D). The report concludes with a prediction that science and technology will have a vastly greater influence on society in the future than they have thus far. Five items requiring early national attention are listed: (1) development of a heightened capability for technological assessment, (2) implementation of worldwide environmental studies, (3) improvement

in utilization of Federal laboratories, (4) provision of adequate Federal financial assistance to institutions of higher learning, and (5) rapid and efficient application of new science and technology to urban problems. (This Document can be obtained as Accession AD 704364 from the National Technical Information Service, Springfield, Va., 22151. Price: $3.00.)

1055. *Background Paper for the National Conference on Goals, Policies and Programs of Federal, State and Local Science Agencies,* **Georgia Science & Technology Commission, Atlanta, Ga., 12-14 October 1970, 34 pp.** This report consists of five separate papers designed "to provide information on science activities at various levels of government, and to highlight critical problems and issues in whose solution science and technology can play an important role". The keynote paper is "Elements of a National Science Policy", by J. E. Mock, Director of the Georgia Science & Technology Commission and Chairman of the National Governors' Council on Science and Technology. It highlights "the active role played by state and local governmental science groups as an important part of the national science program, and the growing need for more effective intergovernmental science policies". The other four papers are (1) "Intergovernmental Science Relations: The State of the Discussion", by I. Feller, Program Director of the Center for the Study of Science Policy at the Pennsylvania State University; (2) "State Science Policy and the Center for the Study of Science, Technology and Public Policy", by D. Barnes, Associate Director of the Center at the University of Virginia; (3) "Science and Technology as an Instrument for Social and Economic Change", by R. N. Foster and W. D. Siemens of the Urban Development Applications Project at ABT Associates, Inc.; and (4) "Actions Speak Louder than Words in Creating Public Understanding of Science and Technology", by C. H. Stevens, M.I.T. Operations Research Center and Science Advisor to the Governor of Puerto Rico. Proceedings of the National Conference will be published.

1056. *Proceedings of the Pennsylvania Science Policy Workshop,* **The Pennsylvania State University Institute for Research on Human Resources, Center for the Study of Science Policy, 24 February 1970, published July 1970, 117 pp.** This report details the findings and recommendations of a one-day workshop attended by state research and development directors, university and industry research personnel, and representatives of the National Science Foundation. It was concluded that the primary areas of concern – health, pollution, and transportation – are all within the political jurisdiction of state and local governments, and thus contributions of science and technology in these problem areas should filter through state and local agencies. Furthermore, local units of government, which have histori-

cally been concerned with the solution of these problems should be granted a stronger role in the formulation of research policies directed at these problems. The report contains prepared presentations and floor discussion at the two panel sessions (Communication of Technological Problems to Sources for Potential Solutions and Funding of State Research Activities), as well as resumes of each of the four workshop sessions (State Agency – Legislative Interactions, State Agency – Federal Government Interactions, State Agency – University Interactions, and University Organization for the Performance of Research). (Copies of this report are available from the Center for the Study of Science Policy, Institute for Research on Human Resources, The Pennsylvania State University, 411 Boucke Building, University Park, Pa., 16802. Price: $1.00.)

1057. *Index to Literature on Science of Science,* **Research Survey & Planning Organization, CSIR, v. 6, nos. 1 and 2, January and February 1970, 48 pp.** This briefly annotated bibliography contains 243 references to literature published during 1969 in 20 journals, mostly U.S. and British. Entries are arranged by category as follows: General, Agriculture, Automation, Defence, Education, Expenditure, Management, Manpower, Planning, Politics, Policy, Foreign Collaboration, Society, Economic Development, Industry, and Organisation. (The Index may be obtained from the Research Survey and Planning Organization, CSIR, Rafi Marg, New Delhi-1, India.)

1058. *Index to Literature on Science of Science, Special Issue on Indian Literature,* **Research Survey & Planning Organization, CSIR, v. 6, nos. 3 and 4, March and April 1970, 27 pp.** This collection of 380 references covering the past 18 years consists entirely of Indian-authored literature selected from various issues of three different Indian bibliographic publications on science and public policy. Entries are arranged by the same categories as listed in Abstract 1057, except that a few are missing (e.g., Agriculture, Automation, Defence, Management, Politics, and Foreign Collaboration). (The Index may be obtained from the Research Survey and Planning Organization, CSIR, Rafi Marg, New Delhi-1, India.)

2000 SCIENCE, DOMESTIC PROBLEMS AND NATIONAL GOALS

NATIONAL GOALS

2055. *Toward Balanced Growth: Quantity with Quality,* **Report of the National Goals Research Staff, Washington, D.C., 4 July 1970, 228 pp.** When President Nixon established his National Goals Research Staff in July 1969, he called for a public report on July 4, 1970 "setting forth some of the key choices open to us as a Nation and examining the consequences of those choices". This report does precisely that. It does *not* recommend specific goals. Rather, it expounds on six representative issues that need to be resolved so that the country can grow and develop in preferred ways ("balanced growth"). These issues are (1) *population* – Should population size be limited? Should population be redistributed? If so, how? (2) *environment* – What should be done to contain future pollution within tolerable limits? What should be done to repair existing damage? (3) *education* – What should be done about problems of service to society, individual self-development, equality of opportunity, educational achievement standards, and finances in colleges and universities? (4) *basic natural science* – Should basic science be permitted to develop in a free unguided manner? How much Federal support should it get? (5) *technology assessment* – To what extent and how should the use of technology be evaluated and regulated to minimize adverse side effects? (6) *consumerism* – How should consumers be protected against difficult-to-evaluate dangers of the wide array of complex products reaching the marketplace as a result of continued rapid applications of technology? The ramifications of these issues are described – each in a separate chapter, and their implications for developing a policy of balanced growth are highlighted in the final chapters. An appendix contains trends and projections (to 1980 in most cases) of GNP, labor force, employment, productivity, personal income, population, value of new construction, expenditures for education, enrollment, and R&D expenditures. (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price: $1.50.)

ENVIRONMENTAL PROBLEMS

2056. *Environmental Quality,* **The First Annual Report of the Council on Environmental Quality, Transmitted to the Congress August 1970, 326 pp.** President Nixon, in transmitting this report to Congress, states that it "describes the principal problems we face now and can expect to face in the future, and it provides us with perceptive guidelines for meeting them". The opening chapter discusses the nature of the threat to the environment and the interrelationship

among environmental problems (e.g., pollution, land-use control, population expansion, and waste of resources). In subsequent chapters pollution of air and water and pollution from solid wastes, pesticides, radiation, and noise are each discussed in substantial detail, and antipollution measures taken by federal, state, and local governments are described. Pressures on the environment are then discussed in a chapter on population, economic growth, and resources; and this is followed by an analysis of the use of land in urban, rural, coastal, and natural regions. There is a chapter on international environmental problems. An exposition of the growing involvement of citizens in environmental affairs is followed by a review of progress in environmental education. The final chapter depicts the need for better, stronger institutions, for improved measurement of the environment, and for comprehensive policies and strategies. A dozen appendices include the texts of various acts, executive orders, and messages relating to environmental quality; a breakdown of Federal funding for pollution control and abatement; and a description of the President's Council on Environmental Quality, under the chairmanship of Russell E. Train. (For sale by the U.S. Government Printing Office, Washington, D.C., 20402. Price: $1.75.)

2057. Coale, A. J., "Man and his Environment", *Science,* v. 170, no. 3954, pp. 132-135. Two basic ideas are discussed: (1) that pure air, pure water, and waste disposal cannot be treated as free in a modern, urban, industrial society, and (2) that increasing population is not the major cause of our growing pollution problems. The author proposes that recycling of air and water used in industrial processes and monitoring of the effluents be required. While it is true at present that raw materials are cheaper than recycled resources, he points out that as resources become depleted, prices will rise and recycling will be necessary. Another recommended measure is the taxing of operations that are harmful to the environment to discourage them or to pay for the necessary cleanup measures. The author presents a discussion of the relation between population growth and age distribution. He points out that the cause of environmental problems lies not so much in the increase in population as in the per-capita increase in production and consumption (e.g., a 200 percent increase in per-capita use of electricity while population went up only 50 percent). Policies regulating fertility level to yield zero population growth at low birth and death rates are also suggested and briefly discussed.

2058. "The Williamstown Study of Critical Environmental Problems", *Bulletin of the Atomic Scientists,* v. 26, no. 8, October 1970, pp. 24-30. The conclusions and recommendations of a month-long study at Williams College, Williamstown, Mass., are presented. Some of the recommendations made regarding specific problems are (1) develop comprehensive global computer models of atmospheric motions and

ocean-atmosphere interactions to study circulation, clouds, precipitation, thermal effects, and the behavior of particulate matter; (2) resolve the uncertainties about SST contamination and its effects before large-scale operation is permitted; (3) curtail the use of DDT and mercury in pesticides as quickly as possible and conduct studies of DDT in marine environments; and (4) develop the technology for nutrient recycling and reclamation in problems of waste treatment and eutrophication of waters. Overall recommendations include setting up the following national and international facilities: (1) an information center for technology assessment, (2) an information center for environmental assessment, (3) a problem-evaluation center to determine urgency of action and identify options, and (4) a public-education service center to compile and disseminate findings of the other centers.

2059. "The Environmental Decade (Action Proposals for the 1970's)", Hearings Before the Subcommittee on Conservation and Natural Resources of the Committee on Government Operations, U.S. House of Representatives, Ninety-first Congress, Second Session, 2-6 February, 13 March, and 3 April 1970, 361 pp. Testimony and recommendations by some 37 "representatives of conservation groups, architectural and planning groups, public health groups, and the labor movement . . . [were presented to help the Subcommittee] to explore existing and imminent environmental problems; to discover what must be done to solve them; to examine the effectiveness and efficiency of existing Government policies and programs; and to develop proposals for new programs where needed". The National Environmental Policy Act of 1969 is included as Appendix 1. (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price: $1.25.)

2060. Howe, S., "New Look in Conservation Brings New Hope for Environmental Quality", *Congressional Record*, v. 116, no. 177, 8 October 1970, pp. E8965-E8966. This is a plea by Mr. Howe, president of the Conservation Foundation, for developers and conservationists to reconcile their seemingly opposing interests and work together to serve the public interest. He suggests that developers and planners involve the public in decision making at the earliest possible stage in any proposed undertaking. Development-oriented agencies, such as the Corps of Engineers, are urged to expand their own environmental outlooks and staff capacities. A number of Conservation Foundation projects are described in which the principle of developer-conservationist cooperation is being successfully applied.

2061. Bylinsky, G., "The Long Littered Path to Clean Air and Water", *Fortune*, v. 82, no. 4, October 1970, pp. 112-116, 33-34. Problems in pollution control are surveyed and discussed. The effects of emission

standards on the auto industry have produced some results in the form of redesigned engines, catalytic converters, and thermal reactors, but so far none meet the 1975 standards of the Muskie bill. States are setting up programs to enforce standards based on national criteria for the release of sulfur dioxide and particulate matter from industrial and power plant smokestacks. Technology is available today to remove the particles, but there are no developed techniques for eliminating the gaseous pollutants sulfur dioxide and nitrogen oxide. A promising method of chemical scrubbing is under investigation. The Federal government is accused of doing little to encourage long-range thinking and planning with regard to control of water pollution. Critics claim that the present $8 million annual federal budget for regional studies should be greatly expanded and used to build large regional sewage treatment plants, at the same time working toward the ultimate goal of recycling and reuse of water, which would obviate the necessity of dumping effluents into streams. Chemical treatment of effluents is being researched as a substitute for mechanical filtering or biological processing, and a number of demonstration plants are in operation. Overall criticisms of efforts to remedy environmental ills are that they are short-term and piecemeal, lacking in imagination and perspective.

2062. Holsendolph, E., "States Join the Pollution Battle", *Fortune,* v. 82, no. 4, October 1970, p. 116. This article discusses the new and stronger measures enacted by some state legislatures to cope with pollution problems specific to their areas and industries. A number of specific examples are cited. **Michigan** now allows citizens to sue polluters without having to show proof of personal damage. Burden of proof has been shifted to the defendant. **California** has tightened vehicular emission standards. In 1973, auto manufacturers will be fined $5000 for each vehicle that fails to meet the standards. The legislature established a water-quality control board with nine regional boards. Violators may be prosecuted and fined up to $6000 per day. **Illinois** has a new environmental protection agency that can fine offenders $10,000 plus $1000 per day until the problem is rectified. The agency may act against municipalities as well and may seal any offending facilities on the spot. This includes grounding smoking jet planes on the runway. **Arizona** has imposed strict emission standards, aimed at the mining companies. The companies must remove 90 percent of the sulfur emission and 99.42 percent of fine particulates that would otherwise go into the air. **Vermont** has moved against water polluters, mainly municipalities with inadequate waste-treatment plants, and **Maine** is working against oil-spill offenders and coastline damage. Several states are requiring proof from potential industrial developers that their projects will meet new state standards, and many more states have or are setting up environmental agencies.

POLLUTION – SOLID WASTES

2063. Driscoll, J. G., "What to do about Trash? Give it a Second Life", *The National Observer,* **2 November 1970, p. 3.** This article discusses ways in which different cities are coping with the increasingly difficult problem of disposing of solid wastes. Under the Resource Recovery Act, signed into law in late October, the Government is authorized to spend "$461 million over 3 years to develop new ways to collect garbage, recycle it, and dispose of what's left", and to pay three-fourths of the cost of new facilities for processing and reclaiming solid wastes. It also "authorizes grants to train workers and teachers in solid-waste programs".

2064. *Policies for Solid Waste Management,* **Report SW-11c prepared by the Ad Hoc Committee on Solid Waste Management of the Division of Engineering Committees on Pollution Abatement and Control, National Research Council, for the Bureau of Solid Waste Management, U.S. Department of Health, Education, and Welfare, Public Health Service Publication no. 2018, 1970, 64 pp.** The background and objectives of solid waste management programs in urban areas are presented. A number of recommendations, resulting from a systems engineering study, are offered by the Committee to guide the Bureau in carrying out its responsibilities. These recommendations include the institution of a strong federal program directed toward (1) establishment of a solid-waste-management information center, (2) conduct of research, development, and large-scale demonstrations of solid-waste-management systems in metropolitan areas, and (3) improvement of system business management, planning, and manpower training. The Committee also recommends a threefold increase in funding over the present level of $14 million during the next 5 years, to pay for an expanded R&D program and subsequent demonstration phases of promising new developments. Grants or cost-sharing funds for conventional or normal advances in state-of-the-art facilities are excluded.

POLLUTION – AIR

2065. "Background for Air Quality Criteria: Looking at Reasons to Regulate", *News Report,* **National Academy of Sciences, National Research Council, National Academy of Engineering, v. 20, no. 7, August-September 1970, pp. 2-3.** The National Research Council is studying biological effects of four types of pollutants (asbestos, lead, fluorides, and certain organic particulates), to provide a foundation for Federal regulatory activity. Mobile and stationary pollution sources would be under separate regulations in the selected 90 air-quality-control regions. Mobile emission standards are set by the Secretary of Health, Education, and Welfare under Title II of the Air

Quality Act of 1967. The control regions will be asked to set stationary-source emission standards that are economically and technically practicable and firm enough to protect general health and welfare. The legal guide is HEW's control-technology document. The study of the four selected pollutants is at the request of the National Air Pollution Control Administration (NAPCA), which has already "issued control-technology documents and air quality criteria for sulfur oxides, particulates, carbon monoxide, hydrocarbons, and photochemical oxidants". The studies are supposed to bring out gaps in knowledge of exposure and effect of the four additional pollutants and to document their "adverse effects at varying levels and in varying circumstances".

2066. "Senate Passes Strict Clean-Air Bill", *BioScience,* v. 20, no. 21, 1 November 1970, p. 1172. "On 22 September, the Senate, by a vote of 73-0 approved a clean-air bill, with stronger restrictions and penalties than any of its predecessors. It is also far tougher than the House-passed bill, necessitating a conference between Senate and House members before a bill can be sent to the White House for approval." Known as the National Air Quality Standards Act of 1970, the Senate version requires the automotive industry to reduce vehicle emissions by 90 percent by 1975, with provision for a 1-year extension if the manufacturers can show the goal to be impractical. It also provides for the establishment of national air-quality standards for ten major contaminants and requires all newly constructed power plants and industrial mills to use the latest pollution-control technology. Civil penalties of up to $10,000 per day are to be assessed for violation of the standards, and Government agencies will not be allowed to award contracts to violators. (For Senate discussion of this bill, see *Congressional Record,* v. 116, no. 165, 22 September 1970, pp. S16212-S16261.)

2067. "Air Transport Less Polluting", *Science News,* v. 98, no. 12, 19 September 1970, p. 252. "If commuters between suburbs and cities could be transported aboard currently available small aircraft instead of automobiles, air pollution from transportation could be reduced to one-eighth its current level, a U.S. Department of Transportation study shows. The study was conducted in the urban portions of Connecticut, New Jersey, and New York. Travel was between such areas as New Haven, Conn., Newark, N.J., and White Plains, N.Y., and downtown Manhattan. The 40 tons of pollutants daily released by automobiles in the three-state urban region could be reduced to five tons, say the researchers. They add that another study shows 30 percent of commuting residents would use an air service if it were available. Vertical take off and landing aircraft appear to be most feasible for commuting, and Rutgers University researchers who did the DOT study claim air traffic problems would be minimal."

POLLUTION – WATER

2068. "Clean Water for the 1970's, A Status Report", U.S. Department of the Interior, Federal Water Quality Administration, June 1970, 80 pp. This status report describes the past activities and future plans of the Federal Water Quality Administration (FWQA). As Interior Secretary W. J. Hickel says in his Foreword, it "describes the point of departure from which we are moving to rescue our water resources in the decade of the 1970's". It begins with a discussion of sources of water pollution (municipal, industrial, mine, agricultural, animal, and watercraft wastes, as well as thermal pollution, sedimentation, and oil spills). Next, a water-pollution-control program for the 1970's is presented, with detailed attention given to the numerous regulatory, financial-assistance, planning, educational, research, development, and demonstration programs proposed or being implemented. The growing number of FWQA activities of an international nature are delineated. Finally, organization, resources, and facilities of the FWQA are described. FWQA's budget was over $300 million in FY 1969, $886 million in FY 1970, and is projected at $1,098 million for FY 1971, "reflecting the high priority this program is receiving from the President and Congress during a period of overall budgetary stringency". By far the largest fraction of each allocation (over 90 percent this year) is for grants to localities for construction of waste-treatment works. (Single copies of this report may be obtained at no charge from U.S. Department of the Interior, Federal Water Quality Administration, Washington, D.C. 20402.)

2069. Vanik, C. A., "For Lack of Research Funds We May be Poisoning Our Waters", *Congressional Record*, v. 116, no. 174, 5 October 1970, pp. E8875-E8876. In this speech Congressman Vanik indicates that detergent companies are substituting NTA (nitrilotriacetic acid) for phosphates in their products to cut down on eutrophication of lakes without adequate assurance that the dumping of 2 billion pounds annually into our waterways will not cause other kinds of harm. The Federal Government is studying NTA for biodegradation, physiological effects on rats, and the effects of its affinity for metal ions. However, "because of limited funds . . ., the problem of cancer produced by derivatives of NTA is not being studied". Vanik believes that it is criminal "for private companies to bring new chemicals and products into the marketplace without the most thorough testing". He is "drafting legislation to require that no new chemical product or compound be brought into interstate markets without prior approval of the Public Health Service and the Environmental Protection Agency that that product is not harmful".

2070. "The Environmental Protection Agency – Message from the President of the United States (H. Doc. no. 91-399)", *Congressional*

Record, v. **116, no. 176, 7 October 1970, pp. H9780 and S17444.** This brief message points out that a study made by the Council on Environmental Quality reveals that "the current level of ocean dumping is already creating serious environmental damage in some areas", that the level is increasing rapidly, and that action is needed to keep it from getting out of hand. The President endorses the Council's recommendation to enact legislation banning all unregulated dumping in the oceans and Great Lakes and promises to submit a specific legislative proposal to the next Congress to that effect. "The legislation recommended would be one of the first new authorities for the Environmental Protection Agency."

ENERGY CRISIS

2071. "Report on 'Electric Power and the Environment' Released", *Atomic Energy Clearinghouse,* **Congressional Information Bureau, Inc., v. 16, no. 39, 5 October 1970, pp. 1-8.** Basic recommendations in the report of a cooperative study by seven government agencies under the auspices of the Energy Policy Staff of the Office of Science and Technology include the following: (1) that long-range planning of electric-utilities expansion on a regional basis be done at least 10 years before construction; (2) that plant sites be divulged publicly at least 5 years before construction; (3) that all new large power plants and transmission lines be reviewed before construction by state or regional agencies, or by the Federal Government if regional agencies do not exist or fail to act; and (4) that a broad and expanded R&D program aimed at solving known problems be conducted. The report details basic findings and specific problems related to the four items above. For example, environmental questions should be resolved well in advance of construction; a single state or regional agency should conduct appraisals; present R&D is inadequate and should include improved methods of dealing with waste heat and solid and gaseous waste from fossil-fuel plants. Furthermore, utilities and industries should share funding of R&D to a greater extent than they do at present and "such efforts should be coordinated with Federal R&D funds". Price policies and rates of consumption should be reviewed to "reflect the real cost to the nation". (Copies of the report "Electric Power and the Environment" are available from the Superintendent of Documents, Washington, D.C. 20402. Price: 75 cents.)

2072. Anthrop, D. F., "Environmental Side Effects of Energy Production", *Bulletin of the Atomic Scientists,* **v. 26, no. 8, October 1970, pp. 39-41.** Problems of growing power demands and inadvertent side effects on the environment are discussed. The author observes that during the period 1940-1968 the population growth amounted to about 1.5 percent annually, but energy consumption sustained an

average annual rate of increase of 3.41 percent. Annual per-capita consumption went from 6.0 kw (1940) to 10.4 kw (1968). The energy-consumption rate has continued its increase despite a decline, in recent years, in the population growth rate. The environmental problems that would result from the number of power plants that would have to be built to meet energy requirements (at present rates of growth) in the next 30 years are discussed. Thermal pollution from nuclear power plants is shown to be greater than that from fossil-fueled plants of the same capacity. It is also noted that the U.S. has gone from a low-population, high-resource nation to exactly the opposite. The article concludes with the statement that the American people must very soon decide "whether they wish to live within a reasonable energy and resource budget or suffer the environmental consequences of a continuation of the present trend".

2073. "Senator Jennings Randolph Discusses Inadequacy of the Federal Research, Development, and Demonstration Efforts on Method to Control and Abate Pollution Resulting from Fuels and Energy Production – the Environment Impact of Fuels and Energy Production are Unacceptable", *Congressional Record*, v. 116, no. 154, 2 September 1970, pp. E7963-E7975. In this speech, Senator Randolph presents a detailed appraisal of the national energy picture today and for the next 30 years, along with recommendations for combating the fuel and environmental problems. He points out that the fossil-fuel shortage is a more serious short-term problem than is the inadequacy of power-generation and transmission facilities. The shift to nuclear power is occurring too slowly, as is the development of commercial fast-breeder reactors. To fill the gap, reliable sources of fossil and synthetic fuels must be developed, along with more efficient means of utilizing them, contends Randolph. He recommends the formation of a National Commission on Fuels and Energy, detailed in S.4092, to formulate "a program for insuring the most efficient utilization of all energy resources, without sacrificing or degrading environmental qualities". The Commission would implement "a national fuels and energy policy . . . to . . . provide priorities for a more balanced research and development program to hasten the development of more efficient energy processes".

2074. Abelson, P. H. "Scarcity of Energy", *Science*, v. 169, no. 3952, 25 September 1970, p. 1267. This editorial calls attention to the necessity for more aggressive measures to cope with (1) the scarcity of nonpolluting (low-sulfur) fuels so that short-term energy needs can be met and (2) the long-term depletion of our oil and natural gas reserves. The near-term situation is aggravated by the scarcity of coal with sulfur low enough to comply with standards in cities like New York, inadequate facilities for refining high-sulfur residual fuel oil, a marked decrease in the availability of low-sulfur oils from Africa and

Syria, and a shortage of natural gas. The author states that more prudent use of energy and skillful employment of coal (through processing) and atomic energy could provide the longer term solutions to our energy problems. He suggests that "a few hundred million dollars a year devoted to research, development, and demonstration plants could be the most valuable expenditure the government could make".

2075. Krieger, J. H., "True Energy Policy Seems Unlikely", *Chemistry and Engineering News*, v. 48, no. 43, 12 October 1970, p. 39. The author provides reasoning for his contention that, though the nation may work itself out of its energy crisis by "piecemeal approaches" (new legislation, regulations, incentives, technology), it isn't likely to come up with a true national energy policy. This claim is based on the fact that the formulation and implementation of effective policy for a problem with such widespread interactions requires a systems approach which, while theoretically feasible, is not likely to be undertaken. Some of the bewildering complex of variables that would have to be factored in are (1) objectives – maximum production?, maximum efficiency?, minimum cost?, etc.; (2) constraints – pollution, conservation, cost, etc.; (3) interdependent economic parameters – natural-gas pricing, coal exports, depletion allowances, production schedules, refinery product mix, power-plant siting, etc.; (4) possible new technologies – conversion of coal to gas and oil, oil from shale, magnetohydrodynamics, advanced nuclear power, solar and gravitational energy; (5) coordination – among cognizant government agencies, among various industries, industry-government; and (6) regulation of industries vital to public power – coal, railroads, etc.

2076. McElheny, V. K., "Toward Nuclear Power", *Technology Review*, v. 73, no. 1, October/November, 1970, pp. 10-11. Problems related to the rapidly expanding use of nuclear power were discussed at a conference on the environmental impact of nuclear electricity generation held at the United Nations in New York. While there was some debate about acceptable radiation-exposure levels and possible risk in the use of nuclear energy to meet power demands, it was noted that the containment of radioactivity is so well under control that a 10-fold decrease in the existing radiation-release standards would not be considered restrictive. Karl Z. Morgan of the Oak Ridge National Laboratory concluded that "the choice therefore seems to be between these relatively small hypothetical risks of the nuclear energy industry and the very real risks of power shortages or a smog-polluted environment and the associated respiratory diseases". The problem of greatest concern is storage of radioactive waste. A Study of Critical Environmental Problems, led by Carroll Wilson of M.I.T. recommended that an "intensive multidisciplinary study be made of the trade-offs in national energy policy between fossil fuel and nuclear

sources, with special focus on safe management of the radioactive by-products of nuclear energy". The AEC is also trying to get development funds for breeder reactors, without which the supply of nuclear fuel would be quickly exhausted.

AVIATION

2077. Winston, D. C., "Langley Reorganization Reflects New NASA Aeronautic Emphasis", *Aviation Week & Space Technology*, v. 93, no. 17, 26 October 1970, pp. 17-18. NASA's reorganization of Langley Research Center reflected "new emphasis on aeronautical research and on an increasingly vehicle-oriented approach to aircraft research and development". Aeronautical research at Langley is now occupying 38 percent of Center personnel, as compared with 25 percent in 1966; and NASA's overall research budget has increased about 10 percent annually. Tentative budget for 1971 is $186 million and NASA's 1972 budget includes $200 million in aeronautical research programs. The increase is considered necessary to compete in world markets, especially the European multigovernment and consortium development programs. The reorganization of Langley created a new aeronautics directorate comprising the following divisions: (1) High-Speed Aircraft, (2) Hypersonic Vehicles, (3) Research Aircraft Flight, and (4) Advanced Technology Transport Office. "NASA officials emphasize that future efforts in aeronautical research will be closely tied to budgetary allowances."

2078. Doty, L., "Aviation Policy Report Submitted", *Aviation Week & Space Technology*, v. 93, no. 17, 26 October 1970, pp. 16-17. An interim report on U.S. Civil Aviation has been drafted by the Transportation Department and NASA, and the final report, CARD (Civil Aviation R&D Policy Study), will be presented by the end of the year. "The report warns that the position of the U.S. in aviation will be seriously weakened unless research capability is strengthened and the current gap between research and practical application of its results is narrowed." Recommendations of this working document include (1) adoption of a systems analysis approach in civil aviation R&D, especially in airport planning and intermodal transportation systems, (2) encouragement of technological-data exchange between military and civil groups, (3) strong research programs to meet foreign competition, and (4) marketing experiments related to the setting of rates and establishing of routes. The report also recommended "that the mechanics for development of policy specified as functions of the National Aeronautics and Space Council be utilized" more fully. Policy issues to be further treated in the final report include the federal role in demonstration programs, government leadership to implement moves by the aviation industry into new development areas, as well as questions involving legal and regulatory problems of multimodal (highway-air transportation) activities.

2079. Masefield, P., "Aviation, Airports and Technology in the 1970's", *Science Journal,* v. 6, no. 9, September 1970, pp. 45-50. The growth of aviation and airports during the past 10 years is discussed and predictions for the next 20 to 30 years are presented. New airports with improved facilities (e.g., high-strength concrete runways) demand technological advances. Aircraft noise will become an important issue, as will airport land use and community growth in the vicinity of large airports. The problem is seen as one of balancing the increased prosperity brought by improved air transportation service against the high initial cost of supertransports (estimated at possibly $40 million each), congested land patterns, and aircraft noise. According to the author, the technological problems may be easier to solve than the economic problems. He foresees transport to anywhere on earth within 45 minutes by ballistic transport.

2080. "Toward the Year 2000", *Science News,* v. 98, no. 12, 19 September 1970, pp. 246-247. "Aircraft users and Government planners have consistently underestimated industry growth and the pace of [air-transport] technology. They have also failed to foresee the social and environmental consequences of this growth. To obtain a better view of the future in this field, the Advanced Transportation Concepts department of McDonnell Douglas Corp. . . . sought the opinions of industry professionals on 10 possible developments. The questionnaire went to 304 persons representing different segments of air transportation. Whether by design or oversight, the query did not address itself to worsening air congestion or to the potential restraining effects on the industry by environmentalists. However, these factors may have been considered by many respondents." Survey forecasts include: (1) nuclear-powered air transport will be operating by 1995 or 2000; (2) over a trillion annual revenue passenger miles will be logged by 1990 or 2000 (1969 level was 217 billion); (3) soon after the year 2000, one-fourth of all travel over 15 miles one way will be by air; (4) by 1990, air shipment of cargo will skyrocket to the same dollar levels as passenger flights and will require separate airports; and (4) 1000-passenger aircraft will be operating by 1990 to 1995.

PESTICIDES

2081. "Pesticide Policies Scored at Ag Meeting", *Chemistry and Engineering News,* v. 48, no. 42, 5 October 1970, p. 7. This report contains highlights from a speech by Dr. E. Mrak, chairman of HEW Secretary's Pesticide Advisory Committee (SPAC), "castigating both Government and the pesticides industry for failure to avoid . . . 'chemical McCarthyism,' . . . that might lead to chaos in food production". Dr. Mrak calls attention to the lack of action in response to a number of his commission's positive recommendations: (1) increase federal support for research on pest control, (2) participate

actively in international promotion of safe and effective pesticide use, (3) specify procedures for testing pesticides and develop maximum-dosage standards, and (4) permit the HEW Secretary to rule on restrictive action when chemicals are suspected of causing cancer. In connection with the latter, Dr. Mrak indicates that the Department of Agriculture should have consulted the SPAC before taking action against some uses of 2,4,5-T. The SPAC recommends that the Military's Pine Bluff, Ark., laboratory be taken over for long-range dose-response studies, financed by the Government with some help from industry.

RADIATION HAZARDS

2082. Tamplin, A. K., and Gofman, J. W., "The Radiation Effects Controversy", and Thompson, T. J., and Bibb, W. R., "Response to Gofman and Tamplin: The AEC Position", *Bulletin of the Atomic Scientists,* v. 26, no. 7, September 1970, pp. 2, 5-12, 48. Authors of the first article present their controversy with the AEC and reaffirm flatly that evidence accumulated since Linus Pauling's Nobel Peace Prize lecture in 1963 reaffirms Pauling's assertion of radiation damage to humans traceable to atmospheric weapons testing. The controversy is outlined in detail, with special reference to an article by Dr. Ernest Sternglass, and refers to the "incredible position" of the AEC that levels of exposure of the American public "have been harmless". The authors further contend that the AEC attempted to discourage and discredit their research. In rebuttal, authors of the second article allege that there were "a number of factual errors and misinterpretations . . . particularly in the section on which the calculations were based" in Tamplin's critique. They reaffirm the basic policy "that all radiation is potentially dangerous and that radiation exposures should be kept as low as practicable". An AEC staff document is cited, in which the uncertainty of basic experimental data is noted, as well as the fact that factors besides radiation that can cause cancer have not been considered in the analysis. The document also states that the relation between low dose rates and cancer cannot be established at this time. Finally, the document considers that lowering the existing standards would be appropriate only if new data became available and "new interpretations and conclusions [were] established through recognized scientific channels".

POPULATION CONTROL

2083. "Tydings' Family Planning Bill", *BioScience,* v. 20, no. 21, 1 November 1970, p. 1173. The Senate passed S.2018, authorizing $991.25 million over 5 years to expand and coordinate family planning services and population research activities within the HEW Department. "The outlook for House passage is favorable . . . The

Senate bill provides for the establishment of an office of population affairs headed by a deputy assistant secretary, to administer all HEW responsibilities in the area of population and family planning. The HEW Secretary is required to report to Congress within 6 months of the bill's enactment a 5-year plan for extension of family planning services to all who want it and for research programs and training of the necessary personnel. The Secretary is further required to submit periodic reports showing progress of the plan. Under the Senate bill, project grants are authorized for the construction and operation of centers for research relating to human reproduction and population dynamics. Funds are also provided for research in fields related to family planning. Project grants to public agencies and nonprofit organizations to assist in the establishment and operation of voluntary family planning projects are also authorized."

2084. "Population Crisis Resolution", *BioScience*, v. 20, no. 18, 15 September 1970, p. 1020. A resolution on the population crisis was adopted by the General Conference of the United Methodist Church of St. Louis, Missouri, on 25 April. "Since there has been so much emphasis placed on 'being relevant', this document is offered as an example of the influence demographers and biologists can have in determining the social and ethical legitimacy of their work." Section A of the Resolution deals with the recognition of the problem by the Church, and the need for the Church to develop education and action programs; e.g., Item A-5: "that the church lay a moral responsibility upon the leaders of government and society to undertake a maximum and sustained effort to meet the population crisis, employing whatever funds and personnel and creating whatever agencies are necessary for that purpose". Section B of the Resolution deals specifically with the role of government, recommending the creation of special agencies and committees dealing solely with the population crisis; sharing by nations of technology, experience, and material resources for carrying out family planning and population policies; transferring abortion regulation from the criminal code to laws governing standard medical practice; and removing legal and administrative restrictions on voluntary sterilization. Section C deals with individual responsibilities.

MISCELLANEOUS DOMESTIC PROBLEMS

2085. Patton, D. K., "Planning the City in a Technological Age", *Astronautics and Aeronautics*, v. 8, no. 10, October 1970, pp. 64-69. Written by the Administrator of New York City's Economic Development Administration, this article offers explicit recommendations for restoring the sociological advantages of city life and for curing some of its ills. The automobile is cited as one source of city problems because it requires an unreasonable amount of city space and pollutes

the air. Patton suggests that cities be provided with mass-transit grids in both vertical and horizontal directions linking residential areas to clusters of commercial, retail, industrial, educational, and cultural institutions, each forming a self-contained downtown "subcenter". Passenger cars would thus become only special-purpose vehicles for excursions outside city limits and for recreational activities. He calls attention to the need for a city government to recognize the special needs of each of its neighborhoods (or clusters) and at the same time work with its regional government on interacting matters (e.g., suburban pollution, highways, land use). He describes several "economic decentralization" programs being tried in New York City, and suggests that aerospace techniques of reliability engineering and system monitoring be adapted to the technological aspects of city operation (such as environmental control and utilities functioning).

2086. "Egeberg Says Health Plan in Works", *Science*, v. 169, no. 3952, 25 September 1970, p. 1295. This article describes a talk given by R. O. Egeberg, HEW's assistant secretary for health and scientific affairs. Egeberg announced that about 100 workers were busy formulating a national health plan in response to an order by President Nixon. He indicated that the plan would contain significant health-policy innovations and that he expects the Administration to give health problems a higher priority than it has heretofore. He noted that the "uncontrollable costs" of Medicare and Medicaid are increasing rapidly and a ceiling is expected on the health budget; consequently, it may be necessary to reduce the funding of regulatory and research agencies such as the Food and Drug Administration and the National Institutes of Health. Egeberg estimated that it will be necessary to train an additional 50,000 physicians, 200,000 nurses, and 100,000 medical subprofessionals to cope with the health crisis.

2087. Carter, L. J., "Industrial Minerals: New Study of How to Avoid a Supply Crisis", *Science*, v. 170, no. 3954, 9 October 1970, pp. 147-148. Secretary of Commerce, Maurice H. Stans announced the forthcoming appointment of a National Industrial Materials Commission. The commission will conduct a 14-month, $250,000 study to "project the demand for nonfuel minerals over the next 30 years, assess domestic and foreign reserves of such minerals, and evaluate government and industry policies as they affect mineral supplies . . . While there is no immediate minerals crisis, present circumstances . . . invite concern." Rich domestic reserves are being depleted rapidly, and conflicts are predicted between mining and environmental interests. There is also competition for mineral supplies from other industrial nations. The Commission will consist of 20 members to be appointed by the secretaries of Commerce and Interior. The planned study will complement efforts in Congress to have the Executive Branch establish a clear, coherent national mining and materials

policy. A measure introduced by Senator Allott and passed by the Senate in September requires the Secretary of the Interior to report annually to Congress on the state of the domestic mining and minerals industry. A House amendment to the bill places "somewhat greater emphasis on the need for recycling metals and for development of land reclamation and other measures lessening the impact of mining on the environment . . . The major thrust of the Allott bill is to promote formulation of policies looking to discoveries and innovations helpful to domestic mining and minerals processing", and thus decrease the dependence of U.S. industry on foreign sources of minerals. Differences between House and Senate versions of the bill are being ironed out in conference.

2088. "The Application of Social and Economic Values to Spectrum Management", Final Report of the Committee on Telecommunications, National Academy of Engineering, June 1970, 99 pp. The following conclusions of the Committee underline difficulties in defining and measuring social and economic values associated with the use of the electromagnetic spectrum to guide the regulation of spectrum space for the maximum public benefit: (1) "the only practical method of reaching decisions involving public interest is through the judgment of individuals"; (2) "social value cannot be measured in dollars"; (3) "there is, as yet, no systematic objective approach by which all of the essential factors can be inserted into a formula or set of formulas and a solution obtained that gives a figure of merit for each proposed spectrum use"; (4) because of the need to satisfy majority will and still protect the minority, there can be no assurance of universal acceptance of decisions; (5) there is a need to research and develop adequate models; (6) choice of assumptions in economic studies is based on choice of social values. Recommendations include (1) assembling a competent staff trained in both social sciences and technology; (2) establishing an advisory panel of experienced "public-spirited citizens" of diverse backgrounds; (3) employing a panel of judges who are diversified with respect to training, background, and experience to ensure a balanced approach; and (4) encouraging further research into evaluation procedures of technical, economic, and social factors. (This report is available from Committee on Telecommunications, National Academy of Engineering, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.)

2089. "Metrication in America", *Scientific American,* v. 223, no. 4, October 1970, pp. 52-53. In 1968 Congress authorized a "U.S. Metric Study" to examine the implications of the increasing use of metric units and to recommend what the U.S. should do about it. Beginning last summer, public conferences were conducted by the National Bureau of Standards with representatives of various segments of the economy. At the first conference, NBS director Lewis Branscomb

predicted that if the U.S. converts to the metric system it will only "be done through a coordinated national program based on the voluntary cooperation of all sectors of the society". The law requires the Bureau to report its findings and recommendations to Congress by August 1971.

3000 NEEDS AND ALLOCATION OF RESOURCES FOR SCIENCE

TECHNICAL MANPOWER

3034. Torpey, W. G., *Optimum Utilization of Scientific and Engineering Manpower,* Whittet and Shepperson, Richmond, Va., 1970, 324 pp. ($10.50). Dr. Torpey opens his book with a discussion of the concept of optimum utilization of technical and scientific manpower (making greatest possible use of their abilities and unique backgrounds), and describes federal activities since 1956 aimed at improving such utilization. He identifies six major aspects of the goal of optimizing the utilization of technical manpower: (1) strengthening selected personnel functions (e.g., by rating of job applicants, in-house training, using meaningful performance evaluations and rewards, and management training); (2) increasing the availability and use of engineering technicians; (3) broadening the role of continuing education; (4) facilitating the retrieval of information; (5) deferring graduate students; and (6) minimizing the impact of defense cutbacks (including recommendations for employers, scientists and engineers, professional and technical societies, educators, and government). Each of the six items is described in a separate chapter wherein the factors involved are analyzed and suggestions for consideration and action are offered. The thrust of the book is that great benefits accrue to all concerned individuals and groups from successful efforts to enhance the utilization of scientific and engineering manpower; it is "a call to action to embark upon . . . a crusade for the better utilization of the human resources of the nation".

3035. Hawkes, N., "The Scientific Mercenaries", *Science Journal,* v. 6, no. 9, September 1970, pp. 23-26. The Washington Office of the European Economic Community held a meeting at Harvard for scientific migrants to discuss European and American professional opportunities. While the new American immigration law has slowed the "brain drain" in the more developed countries, it still hurts the less developed nations. In 1969, out of 10,225 scientific migrants, 5348 came from Asia. The greatest incentive for migration is to enhance one's opportunities in terms of money, freedom of research, and professional advancement. Some of the scientists admit that a united Europe could induce them to return if similar advantages could be offered, though it is doubtful that such a situation could provide enough jobs. "Institutional paralysis" on both the industrial and academic scene is blamed for most of the problem, and though the immigrants experience some difficulty in integrating with American society, they still find it less restrictive in terms of life style and professional satisfaction.

3036. "Entry May Get Tough for Immigrant Engineers", *Machine Design,* v. 42, no. 24, 1 October 1970, p. 8. "Engineers Joint Council has asked Secretary of Labor James D. Hodgson to require that prospective immigrant engineers have a job before entering the United States. Many categories of engineers are currently being given immigration preference because of Department of Labor certification that manpower shortages exist in their areas of employment. Citing findings of a new study by the Council's Manpower Commission, the EJC noted that reduced hiring of engineers on the part of employers could lead to a potential supply-demand imbalance for 1970 and 1971, and recommended that immigration be curtailed until engineering manpower demand has returned to high levels. The EJC recommendation was backed up by a new report, The Future Supply of Engineers 1970-1978. According to this analysis, about 45,000 new engineers will be needed this year and 40,000 in 1971 in contrast to previous Labor Department predictions of 65,000 per year. About the same number of new engineering graduates will become available, barring further changes in the draft or major declines in engineering-college enrollments."

3037. "Employment Cuts May be Easing", *Aviation Week & Space Technology,* v. 93, no. 18, 2 November 1970, pp. 14-16. Defense Department officials believe that cutbacks in military support of the aerospace industry are leveling off, and that future Pentagon budgets will not show pronounced changes. The 1971 defense budget is less than 7 percent of the GNP and 34.6 percent of the federal budget. These figures are the lowest in 20 years and are not likely to rise further. Much of the reductions will come in personnel rather than in procurement or research and development. There is also no evident rule-of-thumb on cutbacks. Most companies are laying off; there is limited hiring. Industry and the Pentagon worry about production teams being broken up with little chance of being reassembled if and when the need arises. Firms have tried to meet declining orders by not replacing employees who leave, retire, or die. Often this type of attrition is too slow, and layoffs are necessary. Firms suffering from military and commercial cutbacks include Boeing, United Aircraft, General Dynamics/Ft. Worth, McDonnell Douglas Corp., Lockheed Aircraft Corp., Vought Aeronautics, and Hughes Aircraft.

3038. "Conversion Research and Education Act of 1970", *Congressional Record,* v. 116, no. 161, 16 September 1970, pp. H8837-H8844. This is a presentation of facts related to H.R.19037 (A Bill to Authorize the National Science Foundation to Conduct Research and Educational Programs to Prepare for Conversion of Defense Research and Development to Civilian and Socially Oriented Activities) and discussions by 6 of its 55 cosponsors. Generally, the arguments in favor of the bill are based on jeopardy of U.S. leadership in science and

technology, loss of export trade in high-technology products, waste of technological talent and the economic slump – all stemming in whole or part from Federal cutbacks in defense and space spending. The bill authorizes $450 million over a 3-year period for general conversion research, for retaining of defense and space-oriented scientists, and for assistance to defense-related small business firms. Specifically, it provides that the National Science Foundation sponsor conversion research and that it develop and administer retraining programs for technical personnel. Also, it stipulates that the Economic Development Administration of the Department of Commerce sponsor conversion retraining programs for management personnel at defense R&D sites. Finally, the Small Business Administration is asked to assist small firms in conversion by providing technical grants, loan guarantees, and interest assistance payments. The bill calls for an advisory committee of industrialists, scientists, and educators to help shape and guide these programs.

3039. "Chemists Supply Leveling Off After 1985", ***Chemistry and Engineering News,*** **v. 48, no. 45, 26 October 1970, p. 19.** This summary of a talk by W. R. Brode, former president of the American Chemical Society, compares college enrollment trends in science and engineering with current and predicted manpower needs. By extrapolating the enrollment of 22-year-olds since 1900 and considering the expected decrease in population growth, Brode concludes that the annual production of scientists and engineers will probably level off after 1985. Until then, he suggests that the expected excess in supply over demand (reaching an estimated 10 percent) be supported by post-doctoral fellowships, educational upgrading grants, public works programs, basic research grants, and society-oriented research grants. Brode believes that "the 1970's may be the last period of technical manpower oversupply", and that by 1991 the pendulum may have swung far in the other direction.

PROGRAMS AND FUNDING

3040. "University Research", ***Bulletin of the Atomic Scientists,*** **v. 26, no. 8, October 1970, p. 30.** "A Special Analysis of the President's 1971 fiscal year budget by NSF shows that federal support of research and development at universities and colleges decreased by 2 percent between the 1968 and 1969 fiscal years. It increased by 2 percent between 1969 and 1970. The budget asks an increase of 2 percent in 1971 from fiscal 1970. Between the 1958-66 academic years, expenditures on R&D by institutions of higher education grew at an annual rate of 17 percent. The annual rate of growth was 11.6 percent from 1966-68. During this period, federal funds financed 61 percent of total university and college R&D expenditures, according to the NSF survey."

3041. "Impact of Changes in Federal Science Funding Patterns on Academic Institutions", *Science Resource Studies Highlights,* National Science Foundation Report NSF 70-39, 15 October 1970, 8 pp. "The replies to two surveys conducted by the National Science Foundation in the spring of 1969 and spring of 1970 reveal that expenditures for academic science increased 7 and 8.5 percent, respectively, in these years. Expenditures from non-Federal funds compensate at least in part for the leveling trend of Federal funding. Private institutions, in general, and the largest public institutions reported the most serious curtailment of monies for science, and of federal funds in particular. The information collected indicates, however, that funding for academic science has not kept pace with the combined increases in general enrollment and higher costs. Large numbers of academic officials reported impairment of graduate programs and research, curtailment of facilities and equipment, adverse career and employment impacts, administrative difficulties, and lowered morale of students and science faculty. New or developing institutions and departments frequently reported problems in meeting planned goals as a result of changes in Federal funding." Four tables and two charts show these findings quantitatively. (Single copies of this report may be obtained by writing to Editorial and Inquiries Unit, Office of Economic and Manpower Studies, National Science Foundation, Washington, D.C. 20550.)

3042. Dean, B. V., et al., "A Preliminary Report on the Economic Impact of Research and Development Budget Decrements", Case Western Reserve University Technical Memorandum no. 169, December 1969, 33 pp. Conclusions from surveys of prior work are presented – that federal cutbacks "have had adverse effects not only on research scientists and their projects but on a generation of students and on the 'financial integrity' of both state and privately supported institutions". A computer simulation model is developed, items of the overall system (world conditions, national security, U.S. policies, lobbies, welfare, etc.) are identified, and functions defining the "index" of a research institution are given in an attempt "to determine the effects of a decrement in the level of financing of R&D projects by the federal government upon research organizations and upon the local regional economy". The authors state that not all the variables "have been properly quantified". Thus, simulations have not yet been run. Questionnaires have been sent to corporations to obtain further data. (This report can be obtained as Accession AD 703897 from the National Technical Information Service, Springfield, Va. 22151. Price: $3.00.)

3043. Phelps, J. B., "Kennedy Urges Greater Federal Support for Science", *Physics Today*, v. 23, no. 10, October 1970, pp. 73-74. In a personal interview, Senator Kennedy told the author that he would

like to see Federal funding of science and technology increased by 12 percent to about $20 billion per year, and then maintained at about 2 percent of the GNP. He believes that the NSF budget should be doubled (to about $1 billion per year) and continued at around 0.1 percent of the GNP. Kennedy, "the leading Senate spokesman for U.S. science", cosponsored a bill to set up government machinery for technology assessment and introduced the Conversion Research, Education and Assistance Act of 1970. The latter would authorize the NSF to spend $450 million over the next 3 fiscal years on research and educational programs designed to redirect the Country's R&D talents from defense to civilian (socially oriented) lines. Part of this money would be used for retraining an estimated 15,000 scientists, engineers, and technicians to cope with crime, pollution, housing, health care, transportation, and education problems. Other points made by Kennedy are that mission-oriented agencies should continue to support basic research, the requirement for research to be relevant does not preclude basic research in many fields, and that "the present level of communication between scientists and Congress leaves much room for improvement".

3044. Boffey, P. M., "R&D Funding: Top Treasury Aide Decries Blind Faith Approach", *Science,* v. 170, no. 3957, 30 October 1970, pp. 512-516. This article discusses high points of a speech dealing with R&D priorities and funding by Murray Weidenbaum, Assistant Secretary of the Treasury for Economic Affairs. While Weidenbaum presented the views as his own and not those of the Administration, the author suggests that some impact on federal support will be felt. Weidenbaum deplored polarization of attitudes toward science and stated that scientific and technological projects should have "hard, objective evidence to justify them". Consideration should be given to cost-benefit questions, cost to society in terms of environment, and whether public funds might be put to other use with better returns. He also pointed out that "science should have fairly level funding in terms of real purchasing power so as to offset the inroads made by inflation and avoid the tremendous swings of a feast and famine cycle". Also needed is "greater understanding of the annual increment of funding by fields and of the base of the investment to help us identify those fields that merit higher priority".

3045. "Mission Agency Support of Basic Research", *Bulletin of the Atomic Scientists,* v. 26, no. 7, September 1970, pp. 35-37. This article is the text of the March 1970 report by the Subcommittee on Science, Research, and Development of the U.S. House of Representatives Committee on Science and Astronautics. The report discusses the level of support of science and the threat that declining support of scientific research in universities poses to the vigor and productiveness of American science. Increases in funding requirements

by universities are caused by (1) expanding enrollment, (2) "need for more sophisticated and expensive equipment and facilities", (3) inflation, (4) "development of inter-disciplinary and multi-disciplinary programs", and (5) "growing demands from . . . society, especially the public sector, for day-to-day services and participation by university scholars in meeting the urgent demands of the 1970s". Academic science is seen as "clearly relevant . . . to the nation's goals for national security, the quality of life, economic strength and productivity, public health and environmental quality, and the lifting of world-wide standards of living". The Mansfield amendment is seen as "potentially disruptive", and the following recommendations are made regarding the interpretation and implementation of the amendment: (1) section 203 should be administered "to produce an orderly shift in sources of research support"; (2) in complying with section 203, care should be taken to "avoid terminating projects on the verge of completion and disrupting research teams of demonstrated quality"; (3) if discontinuation of support of a project is necessary, "reasonable advance notice together with terminal funding of perhaps one year should be given to minimize waste and disruption"; and (4) "the Bureau of the Budget and the Office of Science and Technology should prepare a plan to assure the support for those high quality research projects dropped by the Department by reason of section 203 which should be continued in the national interest. However, this must not be done at the expense of the present National Science Foundation programs." With regard to basic research, it is recommended that (1) "Congress reaffirm the historic national policy that the mission agencies fund their proportionate share", (2) "adequate federal funding be sustained so that the United States does not incur a research gap of its own making", and (3) "departments and agencies of the federal government make special provision for the support of younger scientists as well as established investigators".

3046. Greenberg, D., "Is There Really a Crisis in American Science?", *New Scientist*, v. 48, no. 724, 22 October 1970, p. 175. Despite claims by the scientific community about the declining state of science, this editorial states that there is no concrete evidence that science "is any worse off for the cessation of rapid growth in financial support". Decline in NASA funding has accounted for most of the drop, and there has been a "changed 'mix'" of funds. Nevertheless, the total development budget is $9.4 billion in FY 1971, down from $10.3 billion in 1969, and is still a "staggering" amount. Research will grow to $5.5 billion from 1969's $5.1 billion, and academic R&D will go from $1.426 billion to $1.475 billion. Such sums "are capable of buying a prodigious quantity of scientific and technical activity". One clue to continued productivity is that scientific publications have not decreased, and editors of these publications indicate that the quality of submission has improved. One

reason for anxiety may be that scientists consider growth as the "natural state of affairs". One way to appease the scientific community may be to institute a stable and predictable system of support, and such a system may be on the way.

3047. "State R&D", *Science*, v. 169, no. 3951, 18 September 1970, p. 1186. "State agencies spent $136 million in fiscal year 1967 and $159 million in fiscal year 1968 for research, development, and supporting plant, according to a National Science Foundation survey. The survey, to be published fully later this year, showed that the funds were provided about equally by state and federal agencies. Expenditures included: 40 percent for R&D in health care; 25 percent for natural resources; 15 percent for highways; 10 percent for education; 2 percent for agriculture; 2 percent for police and corrections; and 1 percent for public welfare. There has been an average annual 20-percent increase since 1964."

3048. "FAA Asks Triple Funds for Air Traffic R&D Plan", *Industrial Research*, v. 12, no. 10, October 1970, p. 30. "Congress is being told by the Federal Aviation Administration that unless it can get $150 million a year for R&D during the next decade, air travel will become slower and more dangerous than before the advent of the jet airplane . . . Projects supported by the new funds would follow generally the recommendations of the Air Traffic Control Advisory Committee", including the development of a "superbeacon" to overcome limitations of present radars and more effective data processors to handle the expected traffic densities during the 1980's. Other items proposed by the FAA for R&D are fog-dispersing devices, optimized runway design, scanning microwave instrument landing systems, gun and explosive detectors, and postcrash fire-suppression devices.

3049. Moore, R. T., Sabo, J. J., and Vankirk, D. M. (Eds.), *Grants Activities Supported by the Environmental Control Administration of the Environmental Health Service*, FY 1969, U.S. Department of Health, Education, and Welfare, 1970, 559 pp. The objectives and priorities of each of the five problem-oriented Bureaus that comprise the Environmental Control Administration are stated, along with descriptions of their grants programs and publications as of 30 June 1969. Grants are classified as research, training, fellowship, demonstration, or planning; most are awarded to universities. The Bureaus are (1) **Bureau of Community Environmental Management**, concerned with criteria and standards for maintaining man's health, well-being, and safety (45 grants); (2) **Bureau of Occupational Safety and Health**, providing guidance and technical assistance toward maintaining the health and safety of the working population (66 grants); (3) **Bureau of Radiological Health**, involved with criteria, standards, and control of radiation exposure to man (119 grants); (4) **Bureau of Solid Waste**

Management, dealing with solid-waste storage, collection, and disposal (160 grants); and (5) **Bureau of Water Hygiene**, concerned with criteria and standards of quality of water in public supply systems (30 grants). Four indexes are included: grant numbers, principal investigators, states where grantees are located, and grantee institutions. (This report was issued by the U.S. Department of Health, Education, and Welfare, Public Health Service, Rockville, Md., 20852.)

3050. "Adapting to the Environment", *Science News*, v. 98, no. 12, 19 September 1970, pp. 248-249. Because budget cuts have forced NASA to phase out the Mississippi Test Facility, NASA Administrator Thomas Paine "began exploring possible uses of the facility by other Government agencies – primarily for environmental studies. His efforts were supported by Senator John Stennis and other Congressmen who did not want the center wasted. One result was that in the present NASA budget . . . $10 million has been earmarked for earth and environmental studies by NASA at the center." The Bureau of Commercial Fisheries of the Department of the Interior, and the Coast Guard have "already signed agreements with NASA for use of parts of the facility. NASA is also talking to Federal agencies involved in water and air pollution control. Plans are being made to make the facilities available to the . . . National Oceanic and Atmospheric Agency (largely a research effort) and the Environmental Protection Agency (largely for monitoring and control)." NASA's computer resources at Slidell, La., will also be available. "Data from NASA's aircraft remote sensing flights, as well as from the Earth Resources Satellites and the earth orbiting laboratory, Skylab, both to be launched in 1972, will be made available. 'We are trying to make it possible for a lot of people involved in the environment sciences to get together in a productive, symbiotic relationship,' says Willis B. Foster, a policy officer at NASA headquarters".

3051. "Providing for a National Environmental Data System", *Congressional Record*, v. 116, no. 167, September 1970, pp. H9255-H9256. H.R. 17436 is proposed as an addition to the National Environmental Policy Act of 1969 (Public Law 91-190) to provide for a National Environmental Data System. "The purpose of the Data System is to serve as the central national coordinating facility for the selection, storage, analysis, retrieval, and dissemination of information, knowledge, and data relating to the environment so as to provide information needed to support environmental decisions in a timely manner and in a usable form." The bill specifies that the Data System be managed by a director who is appointed by the President, and be under the jurisdiction of the Council on Environmental Quality. Specified appropriations are up to $1 million for FY 1971, $3 million for FY 1972, and $5 million for each year thereafter.

3052. "Rhode Island Builds Oceanic Science Park", *Industrial Research*, v. 12, no. 10, October 1970, p. 32. A 90-acre oceanics research park is presently under construction next to the University of Rhode Island's Narragansett Bay Campus. The University's Graduate School of Oceanography and two federal laboratories are located at this campus. "This park is the first project undertaken by the Narragansett Industrial Development Corp. (NIDC), a nonprofit, nonbusiness organization established late in 1969 to promote Rhode Island industry. In June, NIDC was awarded a direct $350,000 grant from the federal Economic Development Administration which will be matched by an equal amount of state funds . . . It is anticipated that sites will be available for occupancy sometime next spring."

3053. Greenberg, D. S., "Research Priorities: New Program at NSF Reflects Shift in Values", *Science*, v. 170, no. 3954, 9 October 1970, pp. 144-146. The National Science Foundation, which heretofore has dealt only in basic research and educational activities, is now sponsoring applied research under a fast-growing program called Interdisciplinary Research Relevant to the Problems of Our Society (IRRPOS). To be eligible for a share of the $6 million FY 1971 budget or the anticipated $13 million FY 1972 budget, a proposed program must be based on an interdisciplinary approach and have a significant potential societal impact. The 20 grants already made under IRRPOS represent only a small fraction of the total $500 million NSF budget for FY 1971. They include the following: (1) "The Environment and Technology Assessment" to Oak Ridge National Laboratory, $1,496,000 (largest single IRRPOS grant); (2) "Design and Management of Environmental Systems", Michigan State University, $647,900; (3) "Environmental Systems Program", Harvard University, $589,800; (4) "Political and Scientific Effectiveness in Nuclear Materials Control", Kansas State University, $231,000; and (5) "Land Use and Energy Flow Component of a Model of Society", University of California, $448,000. Though NSF Director McElroy has insisted that problem-oriented research be funded only with "add-on" money, "programs throughout the foundation are increasingly sensitive to the atmosphere that favors the seemingly useful . . . For example it [NSF] recently announced an award of $154,630 under which 15 unemployed scientists and engineers will receive training in computer science at Stanford . . . It is all a part of a process in which the Washington administrators of basic science are getting into step with the political tempo that calls for aiming science toward doing something about problems that are here and now."

3054. "DOT Will Move Fast on Mass Transit Grants", *Engineering News Record*, v. 185, no. 17, 22 October 1970, p. 20. A 12-year, $10 billion public transportation act was signed into law in October, and the Urban Mass Transportation Administration (UMTA) head Carlos

C. Villareal immediately set up a plan and priorities for obligating the $860 million authorized for FY 1971 (through June 30). Two-thirds grants and emergency loans are available to save systems in danger of failing, to improve or extend existing systems, and to develop new systems. This will be apportioned among rail transit systems (over 50 percent), commuter rail systems (about 25 percent), and bus and other mass transit systems (the remainder). The bill authorizes the UMTA to spend $1.86 billion over the first 5 years ($80 million in FY 1971) for research efforts. The UMTA, newest and smallest Department of Transportation agency, is more than doubling its staff (from 59 to about 130) to handle its added responsibilities.

3055. Rose, S., "Making the Turn to a Peacetime Economy", *Fortune*, v. 82, no. 3, September 1970, pp. 110-113. According to this article, the economy is moving toward a postwar basis and while the longer-term outlook is good, the next 18 months will be a difficult period of adjustment. Our problem is a double-recession – cutbacks in both defense and civilian economies with plans to absorb defense jobs in the civilian sector. Econometric projections on the basis of a pre-Vietnam-level budget and cutting defense to a "one-and-a-half-war" size (from two-and-a-half) indicate a healthy economy under the following conditions: (1) reduced taxes, (2) increased nondefense spending by the government, and (3) continued Federal Reserve program of monetary ease. The result would be a growth in real national product of 3 percent in 1971 and 3.6 percent in 1972. Rate of inflation would ease in 1971, and remain "flat" in 1972. Unemployment would settle to just below 4 percent in 1972. Much depends on the "nature of the offsetting civilian spending program". The greatest amount of indirect business is generated by government spending in education, slightly less by defense spending, and least by composite civilian programs. Civilian spending may be tailored by states to meet the needs of a given region in the process of changing to a civilian economy. Defense industries may experience difficulties in converting to civilian markets, but these difficulties can be overcome. In 1975, there is a predicted "peace dividend" of $14 billion, which will be diverted to other programs. The author asserts that the concept of defense soaking up idle resources is outdated! "There will no longer be idle resources for any sustained period of time."

3056. "S4430 – Introduction of the National Economic Conversion Act", *Congressional Record*, v. 116, no. 173, 2 October 1970, pp. S16995-S17003. The purpose of this bill, presented by Senator McGovern, is "to avoid the grave dislocations which now confront the industries, workers, and communities which have grown dependent upon military orders for their economic well-being". Its need stems from winding down of the Vietnam war, hoped-for shrunken arms markets as a result of current arms-limitation negotiations with

Russia, closer scrutiny and economies in all military projects, inability of the space program to pick up the slack in defense work, and the administration's attempts to stem inflation by "slowing growth across the board". According to the bill, administration of the program would be in the hands of a National Economic Conversion Commission, composed of eight Cabinet members, the Administrator of NASA, the Chairman of the AEC, the Director of the Arms Control and Disarmament Agency, the Chairman of the Council of Economic Advisors, and three representatives each from business and labor. Basically, the law would require defense and space contractors to formulate their own conversion plans. Funds for implementation of the plans and benefit payments to workers who might suffer hardship during the transfer to civilian production would come from a mandatory reserve fund established by setting aside 12-1/2 percent of each contractor's profits from defense and space work. The Commission would define conversion policies and programs to be carried out by the Federal Government, assist the States with advice and money for conversion studies, and disseminate conversion-planning information to defense contractors. The bill was sent to the Committee on Commerce on October 2.

4000 NATIONAL R&D PROGRAMS

SPACE

4054. Kohler, F. D., and Harvey, D. L., "Administering and Managing the U.S. and Soviet Space Programs", *Science,* v. 169, no. 3950, 11 September 1970, pp. 1049-1055. This article presents a comparison of Soviet and American space programs and their relation to the political and social system in which the programs are conducted. Parallels in management advances resulting from marshalling resources to meet the space technology demands are discussed. The author concludes that Soviet space activities have had little impact on Russian society, education, and economy because of the rigid political structure. Even so, scientists and technologists are seen as making "the real decisions and determining the actual direction of these enterprises" and thus, to some extent, "reshaping" the system. Until quite recently, Soviet leadership has not been concerned with domestic benefits from the space effort. The overall effect of Soviet compartmentalization has been "to raise, rather than to lower, the barriers against the diffusion of knowledge and technology". This is contrasted with the social, economic, and educational effects of NASA's program in the U.S. and the Agency's efforts to "foster and facilitate the dissemination and utilization of . . . the new scientific knowledge . . . The prevailing national mood [in the U.S. today] is in favor of maximum utilization of resources for the immediate betterment of conditions of life", while in Russia the space program "clearly retains top priority in terms of the availability of human and material resources".

4055. Strickland, Z., "NASA Reduces Manned Space Program", *Aviation Week & Space Technology,* v. 93, no. 10, 7 September 1970, pp. 18-19. NASA's efforts to adjust its budget to the Congressionally Approved level of $3.26 billion are discussed. One effect of the $64.3 million cut is the probable loss of an additional 3000 jobs in the aerospace industry, with employment leveling off at 142,000 persons instead of 145,000. Emphasis will be shifted to the space shuttle, the space station, earth resources technology, applications technology, the high-energy astronomical observatory, and the Grand Tour. In addition to the cancellation of Apollos 15 and 19, cuts were made as follows: (1) tracking and data acquisition, $8 million; (2) facilities construction, $25 million; and (3) research and program management, $23.6 million.

4056. Strickland, Z., "Scientific Community Decries Apollo Mission Cancellations", *Aviation Week & Space Technology,* v. 93, no. 13, 28 September 1970, pp. 55-56, 58. A group of more than 35 scientists who have been studying lunar samples accused NASA in a letter to

Rep. Geo. P. Miller of "sacrificing the whole purpose of Apollo in an attempt to get on to the next major system of spacecraft". Dr. Eugene Shoemaker, former NASA consultant, felt that NASA "was more concerned with engineering accomplishments than with furthering scientific knowledge". He observed that Skylab "does not offer the potential return from a scientific viewpoint as does further exploration of the moon" and expressed doubt that the Apollo program could be restarted after a period of inactivity. He also indicated that he believes that understanding the geology of the moon will help man to understand both the origin of the earth and earth resources.

4057. "Has NASA Finished With the Moon?", *Nature,* v. 228, no. 5266, 3 October 1970, pp. 10-11. NASA's decision to cancel flights of Apollos 15 and 19 is contrary to advice from the Space Science Board of the National Academy of Sciences and NASA's Lunar and Planetary Missions Board. However, reduction of the Apollo budget by $42.1 million will account for a large part of the $64.3 million cut demanded by a Congress that is apparently disenchanted with the manned space program. The two Saturn V boosters already available can be used for other purposes, including the Skylab project. Scientists feel that NASA's decision illustrates the low priority given by the Space Agency to science. However, George Low, acting administrator of NASA, reportedly said, "There is almost nothing in manned space flight I would justify on the basis of science. Science is an adjunct to manned flight."

4058. "Solid Blow to Lunar Science", *Science News,* v. 98, no. 11, 12 September 1970, pp. 215-216. "The announcement by Dr. Thomas O. Paine, outgoing Administrator of the National Aeronautics and Space Administration, that Apollos 15 and 19 would be deleted" as a result of current budget restraints will have repercussions in the scientific and space community. "The cut reduces the chances of geologist-astronaut Dr. Harrison H. Schmitt to fly to the moon . . . and fewer flight opportunities may discourage other astronauts from staying in the program. But the chief loss, says Dr. John W. Findlay, Chairman of the Lunar and Planetary Missions Board, 'is the danger, the probability in fact, that we will [now] not get our first-order scientific answers about the moon from the Apollo program'. Answers to the basic questions . . . depended not so much on flying new experiments each time; the scientific strategy instead was to fly the same experiments several times, but to different locations." NASA is now faced with deciding "how best to redeem the loss in the remaining four flights". Three landing sites must now be selected from the remaining eight prime sites. Six experiments not carried out on earlier missions but planned for Apollos 18 and 19 in 1974 must now be ready 18 months earlier than planned.

4059. "Apollo Clouds Have Silver Lining", *Industrial Research*, v. 12, no. 10, October 1970, p. 30. Four basic reasons were given by top NASA officials for the decision to cancel Apollos 15 and 19: (1) "Apollo 15 had limited scientific potential because it was the only craft after Apollo 14 not equipped with either a lunar rover vehicle or an advanced monitoring package . . . Also, Apollo 15's flight was scheduled for mid-1971 just about the time when NASA will be under great pressure to cut its budget", (2) "Apollo 19 was eliminated primarily because its termination permitted NASA to move the flight of Apollo 18 ahead to mid-1972", (3) "After Skylab [planned for late 1972], Kennedy's staff of 22,000 can be laid off or diverted to development of a space shuttle, a craft with vast scientific potential", and (4) "Doing away with the two flights makes two Saturn V boosters available for other uses."

4060. Driscoll, E., "Testing Man's Value in Space", *Science News*, v. 98, no. 15, 10 October 1970, pp. 303-305. NASA's Skylab program "has grown from a rather inexpensive project using leftover Apollo hardware to a full-blown, several billion dollar science lab", and will be the only manned space flight program between the end of the lunar missions in 1972 and the beginning space shuttle flights in 1977. Skylab is expected to make contributions to basic scientific research and provide useful data on the sun and the earth's environment. Since Skylab utilizes technology and equipment already proven in Apollo flights, it is expected to be relatively inexpensive. The article also details activities, equipment, and scientific programs planned for Skylab.

4061. "Using the Vacuum", *Chemical & Engineering News*, v. 48, no. 40, 21 September 1970, p. 15. Some proposed projects were outlined by NASA at a meeting of international scientists at Ames Research Center, and it was concluded that "zero gravity and vacuum of space could be made available to scientists by 1977 if Congress approves the earth orbital space station program". Jesse Mitchell, director of NASA's Office of Space Science and Application (OSSA) physics and astronomy programs noted that "the things we haven't thought of yet may turn out to be the most important". The proposed space laboratory would permit explorations with large free-flying telescopes unhindered by the earth's atmosphere; tests of relativity theory in a nonearth, zero-gravity framework; experiments with industrial processes in uncontaminated, gravity-free space; and studies of the effects of a zero-gravity environment on biological processes. Estimated cost of the 12-man space station is $12 billion for development, launch, and maintenance for 10 years in orbit. Precursor Skylab, set for launch in 1972, is approved for $2 billion.

4062. Boffey, P. M., "15 Top Economists Oppose SST", *Science*, v. 169, no. 3952, 25 September 1970, p. 1292. Statements by fifteen top economists against the SST were inserted into the Congressional Record by Senator Fulbright. Basic theme of the objections was that the SST should be made to undergo the rigors of "the competitive marketplace". It should be built without government subsidy, as in the automotive industry, which finances its own model changes. If the SST needs federal subsidy, it should not be built, according to one opponent. The economists do not consider balance-of-payments arguments for the SST sound, since the situation is really unpredictable, and they consider the SST a "contrived" export of little merit. The economists rejected the idea that the SST is necessary to maintain a U.S. technological lead, as well as the theory that federal subsidy is needed to "spur employment in the sagging aerospace industry". The latter idea was termed "a return to the outmoded depression philosophy of makework".

4063. Williamson, F.S.L., "The SST, the Environment, and the Credibility Gap", *BioScience*, v. 20, no. 18, 15 September 1970, p. 995. The conflicting aims of a government committed to both the environment and the SST are discussed. According to the writer, "The SST Environmental Advisory Council has concluded that projected SST operations are unlikely to cause significant climatic changes, but that there are uncertainties . . . The *First Annual Report* of the Council on Environmental Quality stated concern over man's ability to modify climate generally, including increasing the water vapor content of the stratosphere, and recommended that further study is necessary to better determine the effect of the SST before mass production begins . . . The ultimate cost of the SST program . . . could easily equal 5 or 6 years of total federal funding for pollution control. There is indeed a credibility gap when we embark upon a program that is a potential global threat . . . and simultaneously state that pollution of the air is our most serious environmental problem."

4064. "SST Goes to the 'Jury' ", *Machine Design*, v. 42, no. 24, 1 October 1970, p. 10. The Senate's decision on awarding or denying $290 million for construction of two prototype aircraft will have a long-range effect on the U.S. aircraft industry. An investigation by William Magruder, director of SST development, Department of Transportation, produced the following observations: (1) **technology** – the engine is practically ready, and airframe construction has not started; completion of structural drawings depends on some of the $290 million funding; (2) **environment** – water vapor, noise, pollutants, and effects on the weather will be negligible; even so, director Magruder favors further research and says that " 'the SST

will be environmentally acceptable before any commitment is made for its commercial production' "; (3) economics -- while three-fourths of the commercial jet aircraft flying in the world today are American made, the market leadership is threatened by France, Britain, and Russia; furthermore, "if the U.S. does not build an SST, it stands to lose 'subsonic business' also". Benefits expected to accrue from the SST are recouping of the U.S. investment plus added interest to the government when 500 aircraft are sold, a favorable balance-of-payment swing of approximately $35-$50 billion, and economic returns in the form of jobs, contracts, and taxes.

4065. **"SST Outcome Doubtful"**, *BioScience*, v. 20, no. 20, 15 October 1970, p. 1116. Opposition in the Senate raises hopes of the opponents of the SST that the bill calling for an additional $290 million for further development of two prototypes may be defeated. "To support the administration's case for the SST, the White House released testimonials from eight cabinet officers . . . The most guarded endorsement by this group came from Interior Secretary Walter J. Hickel, who agreed that building and flying two SST's will not represent any threat to the environment. However, he stressed that 'we insure that satisfactory solutions to these problems exist before a major commitment is made for commercial production'." The first draft of the environmental report on the SST by the Department of Transportation "states that the development and testing of two prototype models of the SST will have no significant impact on the environment, but adds 'additional research is needed in a few areas to provide more data and increased confidence that large-scale SST operations will not have any significant effect on the environment'."

MISCELLANEOUS

4066. *Federal Water Resources Research Program for Fiscal Year 1970*, **Federal Council for Science and Technology, Office of Science and Technology, Executive Office of the President, Washington, D.C., December 1969**, 47 pp. The annual report of the Committee on Water Resources Research (COWRR) of the Federal Council for Science and Technology (FCST) reviews the Committee's objectives, activities, research plans and activities, studies of research trends and users, and presents the Federal Water Resources budget for 1970. Of special interest is the section "Research Needs in Institutions and Public Policy". "A special OST panel of consultants recommended that research on water resources policy and institutions be expanded . . . The panel singled out [and discussed] eight research challenges of timely interest: (1)"Is the river basin a valid water management unit?", (2) "Does multi-purpose planning produce concurrent multi-purpose benefits?", (3) "What key ingredients make trans-basin diversions mutually advantageous to the participating

parties?", (4) "Where and how is it shown that existing water rights doctrines have limited or otherwise impaired needed water resources development?", (5) "What type of grant programs are most effective and efficient?", (6) "Does failure to provide equitable allocation of financial responsibility inhibit or facilitate the resolution of water management problems?", (7) "How do institutional arrangements affect the role of the private sector in water resources development?", and (8) "Are there basic principles of resources management which could provide guidance or insight in the decision-making process?". The report observes that "the estimated Federal expenditures for water resources research in fiscal year 1970 is $132.5 million as compared to $130.6 million for fiscal year 1969. No significant increase has been proposed for any major FCST category. In the light of current expenditures for water resources research and of urgent requirements for other Federal programs, it is highly unlikely that a research expenditure of $199 million for fiscal year 1971 proposed in 'A Ten-Year Program of Water Resources Research' (1966) will be realized." (For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price: 35 cents.)

4067. "NSF Declared Sole Heir", *Nature*, v. 228, no. 5269, 24 October 1970, pp. 308-309. The National Science Foundation will become the strongest exponent of research in Antarctica by virtue of President Nixon's decision to channel all funding for Antarctica through that agency. NSF's budget will be increased by $25 million with the transfer of logistical-support programs from the Department of Defense and the Coast Guard. NSF this year "is spending $7.5 million on all forms of Antarctic research", which, at the seasonal peak, involves about 200 scientists and technicians at the four year-round U.S. bases. A proposed international glaciological project involves a second ice-cap core drill down to bedrock (the first one was done by the U.S. Army Cold Region Research and Engineering Laboratory) in which the United States, France, Russia, and Britain would participate.

4068. "Deep Sea Exploration Stalled", *Congressional Record*, v. 116, no. 181 (Part 3), 14 October 1970, p. E9687. New Hampshire Representative L.C. Wyman deplores the curtailment of deep-sea exploration projects "that are vital to the life of our Nation" and represent human skills that "would take years of painstaking training and . . . a great deal of money to replace". Details of the cuts are spelled out in an editorial reprinted from the journal *Navy*. These include (1) shelving of the whole Sealab program to study living and working conditions 800 feet down, (2) cancellation of the authorization to build four Deep Submergence Search Vehicles to locate and recover objects from the ocean bed down to 20,000 feet, and (3)

cancellation of construction of Deep Submergence Rescue Vehicles to save crews of disabled submarines down to 3500 feet, after only two of the authorized twelve vehicles had been completed. The editorial points out that continuing deep-sea exploration is important to safeguard our deterrent Polaris-Poseidon submarines; to develop techniques for extracting food, minerals, and petroleum from the ocean depths; and to increase the scientific knowledge of our planet.

5000 SCIENCE, EDUCATION, AND THE UNIVERSITY

5025. Brown, G. S., "Can Universities Fulfill the Challenge of Relevance?", *Technology Review*, v. 73, no. 1, October/November 1970, pp. 25-31. The central theme presented is that universities must alter their operations to play a more active public service role. Engineering educators, for example, must prepare students to direct their efforts not only to technological change, but to political, social, and economic change as well. Some specific actions advocated are (1) get students involved in interdisciplinary programs related to tomorrow's problems, (2) promote awareness of the ways in which engineering interacts with social, political, and economic systems, and a willingness to deliberately alter these systems to improve the quality of life, (3) introduce mission-oriented programs utilizing faculty of diverse disciplines and extensive student participation, and (4) make sure that the program has "a central intellectual theme to provide a unifying component that is widely applicable". Present academic administrative practices and departmental organizations are stultifying, and the university must "be reinvented to include doctrines and procedures which enable it to reach beyond the borders of its campus to point the way and help mankind head off disaster". To bring new relevance to academic activities while maintaining objectivity calls for sensitive and mature judgment that is neither "bound by precedent nor over-enchanted by the new".

5026. "Is There Time for Thinking?", *Nature*, v. 227, no. 5262, 5 September 1970, pp. 985-986. This editorial was inspired by Lord Todd's address, "A Time to Think" (see Abstract 1042), advocating certain changes in science education. The editorial discusses insufficiencies in British education, from the lower forms to the system of awarding higher degrees, and concludes that practical reform with emphasis on contemporary relevance is long overdue. Changes are urged in curricula in the lower forms, and in entrance requirements to the universities. Redirecting the "unworkable" and "old-fashioned PhD system" is recommended. Public criticism of the science-education system is strongly advocated "if the institutions concerned are not themselves to be overwhelmed by the reputation for anachronism". It is further pointed out that we need to recognize the intellectual side of scientific life, and that "a more vigorously intellectual profession of science would be an even more prolific source of innovation".

5027. Corbyn, P., and Widd, D., "Science Education in a Social Context", *New Scientist*, v. 47, no. 719, 17 September 1970, pp. 576-577. The dangers and difficulties of failing to consider the social, political, and economic implications of science and technology in

university course offerings and research programs are discussed. Two types of diversification programs and their weaknesses are presented: (1) the "science generalist and professional diversification", which includes industrial sociology, economics, and management studies; and (2) "diversification to give an overall view of knowledge and to promote a more critical, socially aware and socially responsible attitude". Both types of programs have been unsuccessful because the technical specialists lack the interest to make connections between the teachings of the liberal studies departments and the social problems involved in science and technology. Guidelines for teaching the social implications of science are given. Graduate-student research programs directed toward the investigation of the various social and political implications of scientific advances are recommended. Also emphasized is the necessity for scientists and general-studies lecturers to work together on designing and teaching courses delving into the social aspects of specialists' endeavors.

5028. Reuben, B., "Despair Over University Chemistry", *New Scientist*, **v. 47, no. 719, 17 September 1970, pp. 570-571.** The British Science Research Council's (SRC) new policy of diverting support from small departments to science departments of the larger "centres of excellence" is discussed, and the potential damage to smaller universities inherent in this policy is illustrated. Larger universities are already receiving the lion's share of the SRC money, and further diverting of funds in their direction would prevent the smaller schools from ever attaining the "excellence" standards needed to qualify for support. It is further pointed out that smaller institutions, because of higher faculty-to-student ratios, "might provide better training and do better research than the giants". The author also raises questions "as to the justice and effectiveness of selectivity" and "as to the quantity of resources which could be made available by penalizing the less 'distinguished' universities".

5029. Tomlinson, R. H., "Industry, the Universities and Society's Problems", *Science Forum 16*, **v. 3, no. 4, August 1970, p. 22.** The author calls for more interaction between academic science and industry. He notes that most science faculties have no industrial experience and thus no background to provide solutions relating to current technology. He also states that "if universities are to continue receiving government grants in science at present levels, they must conduct at least some research that relates to the problems of society". Furthermore, industrial research is expensive and requires large outlays for equipment of the type already found in university laboratories. The author suggests that industry should arrange to use academic equipment and laboratories in cooperative research ventures when convenient.

5030. Holmes, E. L., "Involving the Universities in Industrial Research", *Science Forum 16*, v. 2, no. 4, August 1970, p. 25. The proper nature of university research was discussed at a meeting of the Canadian Organization for Joint Research held at the University of Windsor. This article is a brief review of that meeting. One issue was the comparative potential of "free" research and that "undertaken under contract in relation to the requirements of specific problems of Canadian industry and government by industrial research institutes (IRIS) and similar organizations". A proponent of applied research argued that it kept the faculty "in touch with real world problems" and that the nation would obtain "direct benefit from the research capabilities of the universities". Other benefits would stem from the valuable practical experience gained by both faculty and students.

5031 Betz, F., and Kruytbosch, C., "Sponsored Research and University Budgets: A Case Study in American University Government", *Minerva*, v. 8, no. 4, October 1970, pp. 492-519. A detailed analysis of the university budget system with regard to "Instruction and Departmental Research" and "Organised Research" is presented. The former category involves the full-time and auxiliary teaching staff, salaries, departmental and administrative support. The latter category "comprises academic and non-academic salaries, supplies, equipment, etc., for institutes, bureaus, non-departmental (research) laboratories and research organisations as well as . . . grant and contract research activities". The case studied is the University of California system. It was concluded that "research in the university has not been given any measure which could be used by the state authorities in deciding the scale on which it should be supported" and that "Federal funds have entered . . . the university system as elements alien to the prevailing system of budget construction". The administration could measure the contribution of state funds to instruction, but had "no comprehensive view either of the varieties of research activities or of the relationships between teaching and research". Major pressures for coordination of the use of university resources for large-scale research programs have come from decreases in Federal research funds and attack from "public legislative circles" and from radical students "on the performance of certain kinds of research in the university".

5032. *Management of Federally Financed Research by the University of Michigan – A Case Study*, Report B-117219 to the Congress, by the Comptroller General of the United States, General Accounting Office, 28 September 1970, 126 pp. Because Federal funding of research in educational institutions comprises about 10 percent of the Federal research outlay, the General Accounting Office (GAO) studied management of research in one of the larger institutions – the University of Michigan. Reviewed by the GAO were (1) organizational structure, (2) processes of "creating research ideas, finding

sponsors, and formalizing proposals", (3) funding methods, (4) accounting of direct and indirect research costs, (5) equipment procurement, and (6) monitoring of projects by the Federal sponsoring agencies. The study resulted in the following recommendations: (1) Government cost principles relating to interest cost "should not be repealed or substantially altered", (2) a feasibility study should be made of "adopting a uniform system of providing universities with sufficient advanced funds for programs financed by all agencies", (3) predetermined fixed rates should be used with a "roll-forward" provision for advancing plus or minus differences between estimated and actual costs to the next funding period, and (4) multiple rates should be used to yield "more equitable distribution of indirect costs to the individual Federal agencies". (The report is available from Distribution Section, Reports, Room 6417, U.S. General Accounting Office, 441 G Street, N.W., Washington, D.C. 20548. Price: $1.00.)

5033. **"Suggestion for Graduate Aid in Exchange for Service"**, *Physics Today*, **v. 23, no. 10, October 1970, p. 75.** Dr. Philip Handler, at science policy hearings of the House Subcommittee on Science, Research and Development, suggested that the Government should "offer financial support to all graduate students in all fields in exchange for two, three, or more years of national service". He noted "limited precedents" in the GI Bill, and suggested diverse areas in which students so supported might serve. Specific science-policy recommendations were also presented by Handler: (1) continuation of mission-agency research support, (2) support of all fundamental research "of which we are capable", (3) multidisciplinary, problem-oriented research in universities with "separate physical and administrative units", and (4) a federal agency "built on NSF as a cornerstone, whose principal mission is research and higher education" as opposed to a Department of Science.

5034. **" 'The Graduate Education Act of 1971' Would Give Financial Support for Graduate Schools"**, *Congressional Record*, **v. 116, no. 181 (Part 3), 14 October 1970, p. E9411.** Representative D. M. Fraser calls attention to a recommendation by the President's Task Force on Higher Education that "new support patterns must be developed quickly [for graduate and professional education] if we are not to see the partial collapse of a system of higher education unique in the world and fundamental to the strength of the United States". In response, he urges the passage of HR 19711, the text of which is included in the *Record*. Briefly, it provides for $300 million annually (beginning in FY 1972) to be divided among U.S. institutions granting Ph.D.'s, in proportion to the number of Ph.D. degrees granted to U.S. citizens in the prior 3-year period. The bill calls for the establishment of a 21-member Graduate Education Council, chaired by the Director of the National Science Foundation, who is also the

administrator of institutional grants under this act. The Council is to review the effectiveness of the program and advise the Director in administrative matters. According to the article, the need for such a bill stems from the fact that graduate education is vital to the nation, and that cuts in federal research and training budgets and inflation are causing financial pressures on graduate schools that cannot be met by local governments or private endowments.

5035. "Environmental Education", *BioScience*, v. 20, no. 18, 15 September 1970, p. 1021. "The House passed the Environmental Education Act by a vote of 289-28 on 3 August and the bill was sent to the Senate for its approval. [It was passed unanimously by the Senate with committee amendments on 21 September and returned to the House (*Congressional Record*, v. 116, no. 164, pp. S16068-S16071)]. HR-18260. . .provides for the development of curricula materials on the environment, pilot projects, community education programs, and preservice and inservice training on environmental problems for teachers and other civic employees and leaders. Congress authorized the expenditure of $5 million for the program during fiscal year 1971, $15 million for fiscal year 1972, and $25 million for fiscal year 1973. The Administration did not actively support the passage of the bill. Secretary of HEW Elliot Richardson did say, however, that while the Administration did not feel that further legislation was necessary to the fulfillment of the bill's expressed purposes, 'We are in accord with its objectives and do not oppose its enactment'."

5036. "Schools Program Courses to Combat Pollution", *Chemical & Engineering News*, v. 48, no. 44, 19 October 1970, pp. 72-73, 75, 77. This article surveys activities of universities that are in the process of reorganizing and redirecting degree programs in the area of environmental service. Diversity of approach is the rule. Some schools concentrate on undergraduate training, others on graduate work. Each school "is building its own program tailored to the individual strengths and needs of the particular campus". UCLA presents the "most novel approach" to a degree program for doctor of environmental science. Candidates with science or engineering undergraduate degrees will spend 2 years expanding their knowledge and skills in scientific and social science backgrounds. At this point the student could stop with a master's degree. The third year would be devoted to multidisciplinary problem solving by teams of students. The last 2 years would be spent in internship in government or industrial laboratories working on environmental problems. The departure from tradition is the emphasis on applied rather than basic research, and no writing or defending of a research thesis is involved. The curriculum is not yet approved by the board of regents, but it is expected to be approved within a year, and on this basis, several applicants have already been accepted. The ad hoc task force of students, faculty,

and consultants who mapped out the program was supported by a $22,000 National Science Foundation Grant.

5037. **Roy, R. (Ed.),** ***Materials Science and Engineering in the United States,*** **Proceedings of the National Colloquy on the Field of Materials, The Pennsylvania State University Press, University Park, Pa., 1970, 177 pp. ($9.50).** This book "documents the results of the National Colloquy . . . covering university education and research in materials; the interaction of the university, industry, and government; federal project funding; and future trends and current developments in materials research in the United States, Britain, and France". Of special interest in the science policy area are (1) a paper on the "Role of the Federal Government: Objectives, Magnitude of Funding, Evaluation", by N. E. Promisel, Executive Director, National Materials Advisory Board, National Academy of Sciences, and (2) "Possible Impact of U.S. National Policies and Goals on Materials Science and Engineering", by H. Brooks, Dean of Applied Science, Harvard University. Included are the texts of these and the seven other principal addresses, plus summaries by joint rapporteurs for the various discussion and panel sessions.

5038. **Walsh, J., "Faculty Salaries: 1969-70 Year May Have Ended an Era for Academe",** ***Science,*** **v. 170, no. 3955, 16 October 1970, pp. 306-308.** "Increases in faculty pay last year on the average barely outpaced the rise in living costs, and many state-financed colleges and universities found their patrons in the state legislatures determined to exercise closer control. A combination of factors appears to have been brought about the change. Public reaction against campus disturbances doubtless contributed. But the . . . financial plight of many colleges and universities and the drastic tightening of the academic job market which occurred last year appear traceable mainly to the pressure of rapid inflation occuring after a period of very rapid expansion in higher education and to the drastic cutback in federal expenditures . . . In almost every state with a sizable university system, decisions on higher education policy, which formerly were settled within the major universities are now made by state governments. . ." It is feared that legislature's actions may interfere with the universities' traditional prerogatives of self-determination. Also, discontent among academics may turn them to consider the possibilities of collective bargaining.

5039. **"Scholar Flow",** *Science,* **v. 170, no. 3957, 30 October 1970, p. 519.** The Institute of International Education's (IIE) publication *Open Doors* yielded the following information on international flow of students: the number of foreign students studying in America in academic year 1969-70 increased by 11 percent over 1968-69, while the number of Americans studying overseas declined slightly.

Incoming students (147,618 last year) "outnumber U.S. scholars abroad almost 5 to 1". IIE's president Kenneth Holland attributed this to "federal purse tightening and changes in university scholarship priorities". He also notes that "international education has lost its luster as a public and intellectual value". The publication "contains statistical tables on origins, places, and fields of study, and sources of financial support for international scholars". (*Open Doors* can be obtained from IIE Publications Division, 809 United Nations Plaza, New York City 10017, Price: $3.00.)

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PLANNING

6059. "Assistance in Transportation Planning", *News Report*, National Academy of Sciences, National Research Council, National Academy of Engineering, v. XX, no. 8, October 1970, pp. 6-7. "The U.S. Department of Transportation has contracted with the National Academy of Engineering for advisory services on technological problems in Federal transportation planning . . . NAE's recently formed Committee on Transportation will advise the Secretary and Undersecretary on Transportation on engineering aspects of transportation problems ranging from propulsion technology to departmental planning . . . Possible study areas for the committee include engineering problems in national and regional transportation systems that embrace two or more forms of transportation (rail and truck, for example); problems of application of new technologies in design of vehicles and propulsion plants; and problems of priority determination in the Office of the Assistant Secretary for Systems Development and Technology."

TECHNOLOGY ASSESSMENT

6060. Kiefer, D. M., "Belling the Technological Cat", *Chemical & Engineering News*, v. 48, no. 42, 5 October 1970, p. 17. This editorial points out that technology assessment by the Federal Government will necessarily deal with "big science", but that technological development begins with small projects whose significance may be difficult to evaluate. The writer states that technology assessment may prove to be a stimulant to innovation, and throw "the relationships between technology and the environment into clearer perspective, . . . [adding] a new socioeconomic dimension to technological planning". The gist of the article is that technology assessment has potential benefits beyond simply pinpointing adverse by-products of technological achievements.

6061. Kiefer, D. M., "Technology Assessment", *Chemical & Engineering News*, v. 48, no. 42, 5 October 1970, pp. 42-56. The promise and problems of technology assessment are discussed in depth. Technology assessment is defined as "an attempt . . . to establish an early-warning system to control, direct, and, if necessary, restrain technological development so as to maximize the public good while minimizing public risk". While there is "spreading public recognition" that the job must be done now, industrial experts have been noticeably holding back, owing to the fear that technology assessment as presently discussed context may restrict development and

innovation rather than enhance it. Representative Daddario, who is largely responsible for current attention to the problem, feels that if assessment is "done well" it would "actually foster the use of unemployed technology and reduce the costs of innovation in the long run". Assessment has been around in one form or another for some time; what is new is that "decision regarding the exploitation of technological developments must rest on more than simple, self-interested analysis". Problems of effective assessment are formidable: (1) reliability "declines rapidly with extension into the future and with the number of sequential events predicted", (2) meaningful assessment can be made only "within a context of broad national goals", (3) to be effective, technology assessment must include a rationale for decision making, and the means to implement decisions if assessment is not to be a useless exercise, (4) the attachment of quantitative values to the thing assessed should not be over-emphasized, (5) "any assessment on which a major policy decision hinges will have to be flexible" and capable of responding to new developments, and (6) careful thought must be given to choosing the type of experts to do the assessing, the responsible group or agency, and the methodology to be employed. The wide-ranging debate on these topics is presented in detail and interviews with a number of experts in the field are reported. The author concludes that "the advocates of technology assessment are seeking ... hardheaded practical ways to set policies and priorities in a more rational manner based on a better informed viewpoint".

MANAGEMENT

6062. **Greenberg, D. S., "Science Under Nixon: Influence Has Declined in National Affairs",** *Science*, **v. 169, no. 3950, 11 September 1970, pp. 1056-1057.** The history of the relationship between the White House Office of Science and Technology (OST) and the Bureau of the Budget (BOB) from the Kennedy administration to the present is discussed and the diminished influence of the OST is noted. While White House staff members are not entirely sure of Nixon's attitude toward science, "there's no doubt that he's hostile to the universities ... Basic research ... has to ride on the coattails of what science can do for society ... [and] there's no reason why good science can't be done in the name of social problems." Science Adviser David has made few public announcements on changes in policy. One change is the upswing in the National Science Foundation budget, leading to speculation that the NSF may emerge "as the principal, though not sole, government mechanism for financing academic research".

6063. "Science Policy Enters Crucial Period", *Chemical & Engineering News*, v. 48, no. 43, 12 October 1970, pp. 26-28. This article

discusses current attitudes on the state of science policy, as reflected in last summer's hearings of Rep. Daddario's Subcommittee on Science, Research, and Development. General areas of agreement by those testifying include the following: (1) "more federal money for R&D would go a long way toward obviating a formalized science policy", (2) NSF "should be the principal supporter of basic research funded by the Federal Government but . . . mission agencies . . . should continue to fund basic research", (3) "there should be greater coordination of the federal research effort", but not by a "Cabinet-level Department of Science". Philip Handler, president of the National Academy of Sciences, and Jerome Wiesner, Kennedy's science adviser, both expressed dismay at the low morale of the scientific community and fear that the American lead in science is in jeopardy. Lee DuBridge, Nixon's first science adviser, pointed out that during the era of high growth rates of R&D, there appeared to be no urgent need for a federal science policy. He noted that any federal policy for R&D must have enough flexibility to accommodate the inevitable changes in national priorities and policies. The writer observes that the new Presidential science adviser Edward David has taken no clear stand on national science policy. He also predicts that the Science Subcommittee will have a turnover of over half its membership when Rep. Davis succeeds Daddario as its chairman in January, and that it will operate at "a little more leisurely pace".

6064. "Interinstitutionalism", *Chemical & Engineering News,* v. 48, no. 43, 12 October 1970, pp. 10-11. NSF's director Dr. William McElroy discussed the trend away from strong specialization and toward "interinstitutional research" at the annual meeting of officers and corporate associates of the American Institute of Physics. He noted that interinstitutional research could eliminate barriers among government, university, and industrial research laboratories. For instance, traditionally, research grants to industry have been made only for work on specific applied problems; whereas universities could obtain grants simply to pursue an idea. "Dr. McElroy believes NSF can provide specific leadership in bringing institutions together", and welcomes "specific proposals for ways in which cooperation might be facilitated in interdisciplinary, problem-oriented, research programs". At the same meeting, Yale physics professor D. Allen Bromley also "called for more direct involvement of industry in national scientific efforts".

6065. Bessey, R. F., "Environmental Defense and Effective Administration", *Public Administration Review,* v. 30, no. 5, September-October 1970, pp. 563-566. The problems of pollution are discussed from a global point of view, with emphasis on planning and administration. "The accelerating technology and material production of the developed countries and the rising expectations and movements of

the underdeveloped . . . are leading to . . . extreme pressures on the environment . . . If the world's pollution is to be brought under control and residual materials recycled and absorbed without irreparable ecological and environmental harm, . . . new concepts of management and administrative science and technology are imperative . . . At the national level a strong – well-staffed, creative, leading, and dynamic – environment-conservation organization is essential in the Executive Office of the President . . . It will have to serve as nerve center in the vast field of environmental conservation – involving all resource management agencies of government and various ecosystems and economies, in disparate subnational and international regions, and on the world and United Nations scene. It should be organized effectively on subnational federal-state regional as well as functional lines. Such an organization would *supplement* more effective environmental programs in responsible departments and subdivisions of government."

6066. Warne, W. E., "Water Resources, Economics, and the Environment", *Congressional Record,* v. 116, no. 157, 10 September 1970, pp. E8076-E8080. This speaker states, "Despite the new consciousness of water pollution as a menace to well-being in urban America, the programs undertaken to resolve water resources problems seem underdeveloped and hesitant . . . The problems . . . are not all in technical fields . . . The more intransigent problems are found in the fields of public policy formulation and political organization and administration." He illustrates this by describing the pollution and jurisdictional problems of the Potomac River, the Colorado River, the Santa Ana River, and other areas. The speech concludes with an urgent plea for the development of goals and continuous planning to cope with the present "crisis in water [which] . . . is engendering conflicts that, unless they are resolved through timely action, will break out into increasingly bitter contests as the population swells".

6067. Gilluly, R., "Taking Polluters to the Courts", *Science News,* v. 98, no. 13, 26 September 1970, pp. 273-274. Citizen action in the courts against polluters is discussed and is illustrated with specific cases. A current view that is gaining strength is that courts must protect the rights of citizens to a clean environment "because of the nonfeasance or malfeasance of local, state and Federal executive agencies". Senators McGovern and Hart, and Representative Udall, advocates of citizen court action against polluters, have introduced a bill embodying the following: (1) Government immunity to citizen suits on environmental matters would be eliminated, (2) standing would be given to any citizen with an environmental grievance, and (3) requirement for proof of specific damage would be eliminated, and courts would be allowed to close down an offending industrial operation. Significant is a trend involving suits brought by local and

state governments. Northern States Power Co. vs. the State of Minnesota will determine the state's right to set radiation standards, and the outcome will have a significant effect on the AEC's regulatory powers. While the adversary system is considered a bit harsh on the defendant, regulatory agencies have been considered by environmentalists to be more cooperative with polluters, who are usually corporations having great economic power. Consequently, "court action may be the most effective route to environmental cleanup".

6068. "Innovation Group Helps Direct Company Research", *Industrial Research,* v. 12, no. 10, October 1970, pp. 31-32. "Recently, Alcolac Chemical Corp. has come up with a novel approach to [the] basic question of how to increase return on the research dollar . . . – the establishment of a scientific council, a group of noted scientists in a variety of disciplines who are not members of the firm . . . [The council holds] regularly scheduled meetings to exchange ideas and to answer specific questions in the company's industrial research programs . . . When the council is confronted by a specific research question, reactions and interactions occur which: aid in the selection of research projects; improve the probabilities of success in projects selected; and enhance the creative aspects of applied research . . . The spin-off from the sessions is expected to guide Alcolac into new areas of technological development outside the firm's present operations . . . Alcolac has concluded that about eight participants is the optimum size for sessions. The firm also is experimenting with the composition of the council to produce the right mix of talent . . . Humanitarian aspects of technological developments also are taken into account . . . This approach helps direct research considerations to what product or process innovations might have public benefits."

AGENCIES

6069. *Mobilizing to Use the Seas,* The Report of the President's Task Force on Oceanography, June 1970, 12 pp. This report summarizes the recommendations of a 16-man task force, following 2 months of deliberations and study of current U.S. oceanographic activities. After reviewing the importance of marine affairs to the U.S., the report presents eight national goals and points out the need for an improved management structure to expedite assignment of priorities and implementation of needed marine programs. The task force recommends the establishment of three new groups: (1) a National Marine Agency to advise the President on national marine affairs, and to administer and coordinate marine programs (through existing organizations); (2) a National Marine Advisory Committee to give guidance to the Director of the National Marine Agency, the President, and Congress regarding the U.S. marine program's compatibility with long-term

policies and national goals; and (3) a Marine Coordinating Committee chaired by the Director of the National Marine Agency and made up of representatives from all U.S. Government agencies with marine interests. (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price: 15 cents.)

6070. "Science is Still the Instrument", *Technology Review*, v. 73, no. 1, October/November 1970, p. 85. Dr. Philip Handler proposed to the Federation of American Societies for Experimental Biology that the current period of decreased scientific support be used to reorganize the "mechanics of science, by the formation of a federal agency for research and higher education directed by a secretary of cabinet level". The new agency could give orderly support instead of the present fragmented support and provide funds for both research and education, which Handler considers inseparable functions, at the national level. Such an agency would help in "blending . . . science and humanism", endeavors which are presently separated by separate systems of support.

6071. "Opposition to EPA and NOAA Fails", *BioScience*, v. 20, no. 21, 1 November 1970, pp. 1172-1173. When Congress failed to take action against their establishment, the Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Agency (NOAA) became law 60 days after they were proposed as part of the Presidential reorganization plan. EPA will be an independent agency, and NOAA "will be administered by the Commerce Department". Conservation groups that lobbied against NOAA object to its being placed under the development-oriented Commerce Department, because conflicts between development and a healthy environment might be resolved with bias. Conservationists also argued that EPA should be a Cabinet-level agency, and also that it falls short of a "total effort". Despite criticism, most Congressmen feel that the advantages of the reorganization outweigh the disadvantages.

6072. "NOAA is Born – But Broke", *Ocean Industry*, v. 5, no. 11, November 1970, p. 44. According to this article, the newly created National Oceanic and Atmospheric Agency (NOAA) is without either an administrator or funds, and neither is likely to be provided soon. Funding levels will be known when the President submits the proposed 1972 budget to Congress next year, but funding will probably reflect the current budget squeeze and maintain its current pace of $300 million per year for oceanography. NOAA presently combines a "grouping of the various agencies having ocean-related functions". It will be assisted by the Marine Science Council, whose life span has been extended to June 30, 1972. Areas being considered for initial major programs are the Great Lakes and estuaries. Also, environmental problems of waterways and shores will probably receive high

priorities. Deep-sea projects will be continued but not accelerated. Government will probably "look to industry to provide the major impetus to progress in man's use of the sea", and will not undertake to finance any "spectacular" projects.

PERSONALITIES

6073. Greenberg, D. S., "Nixon's Science Adviser: Genesis, Progress of a Surprise Appointment", *Science,* v. 170, no. 3956, 23 October 1970, pp. 417-419. Policies and precedents surrounding the appointment of presidential science advisers are discussed. Emphasized is the fact that the appointment of Edward David represents a break with tradition. The fact that David was part of a "star team" at Bell Telephone Laboratories carried considerable weight, since Bell Laboratories' executives have long been associated "with the government's most important scientific and technical activities". David prepared himself in advance by conferences with key White House staff members to assure himself of their support. Problems considered "high priority" by David "include unemployment in the aerospace industry, 'gyrations' in support of basic research, . . . and national energy needs . . . He sees himself dealing with four constituencies: the science and engineering communities, the White House Staff, the government research organizations, and the public."

6074. Greenberg, D. S., "Daddario: Scientific Community's Friend on the Hill is Leaving", *Science,* v. 169, no. 3952, 25 September 1970, pp. 1291-1293. Daddario's record as chairman of the House Subcommittee on Science, Research, and Development is reviewed and discussed. Daddario gave the scientific community an open forum before an antiresearch Congress, though he was powerless to provide funds for science. He remained a friend to science during a period in which it was fashionable to be a critic. The National Science Policy hearings, "Daddario's farewell to the science-government relationship", resulted in more than a thousand pages of testimony, which included the usual observations, e.g., more money is needed, NSF should be a cornerstone for federal support of basic science, and mission-oriented agencies should retain some support of basic science (see Abstract 6063). Assistant Secretary of Commerce for Science and Technology Myron Tribus observed that the need for a science policy should not be justified on the basis of a need for more money in support of science. Rather, he claims that "today we need a national science policy as a tool to enable us to make better use of limited funds". Listed as another achievement by Daddario is a much-needed exposition of the "murky" subject of technology assessment, which is now available in the form of public records of the extensive hearings of his subcommittee.

6075. "John Davis Likely to Succeed Daddario", *Physics Today*, v. 23, no. 9, September 1970, pp. 73, 75. Rep. John W. Davis of Georgia is named as the probable new chairman of the House Subcommittee on Science, Research, and Development. The post is being vacated by Emilio Q. Daddario, who resigned to run for Governor of Connecticut. Davis, who is now Chairman of the Subcommittee on the National Bureau of Standards and a member of the Subcommittee on Advanced Research and Technology, has been a member of Daddario's group since 1960. Davis believes "that Congress will eventually take a major role in shaping U.S. science policy" and foresees a trend toward centralized federal support of science research and education. He also feels that technology-assessment mechanisms will be established in the next year or two, and he opposes restrictions on mission-agency support of basic research. He noted that scientists "often overlook the extent to which Congressmen must respond to pressures for economy and the demands of their constituents".

6076. Carter, L. J., "Bureau of Mines: Long Search for New Director Ends", *Science*, v. 170, no. 3955, 16 October 1970, pp. 309-310. The U.S. Bureau of Mines, which has been without a director for 6 months, will now be headed by Elburt F. Osborn, geochemist, and vice-president for research at Pennsylvania State University. "In Osborn's view, fundamental to all of the problems of the domestic mining industry is a need for larger and more effective programs of education and of research and development in the mineral sciences. He hopes to see the Bureau of Mines mount an expanded R&D effort [beyond the current $50 million per year] that would provide answers to environmental problems [of mines] . . . and narrow the gap between demand for mineral resources in the United States and domestic sources of supply." Osborn will also be pressing to have the government support university-based research and education in mining. A "NAS-NAE report produced by Osborn's panel [on mineral science and technology] last year included several major recommendations . . . One called for establishment of a cabinet-level council to be responsible for determining the United States' major needs and policies in the field of mineral resources. Another urged that a national minerals reference center be set up in the office of the Assistant Secretary for Mineral Resources to keep statistics on minerals supply and demand." The article also discusses a staff report suppressed by the bureau last year regarding the environmental effects of underground mining and minerals processing.

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FOREIGN AFFAIRS

7030. Walsh, J., "Foreign Aid: Reorganization Should Further Abet Research", *Science*, v. 169, no. 3951, 18 September 1970, pp. 1184-1188. Possible reorganization of the Agency for International Development (AID) to improve its efficacy is discussed. The Administration's proposed changes are based on recommendations by the Task Force on International Development, headed by Rudolph Peterson, president of the Bank of America. The Task Force report (*U.S. Foreign Assistance in the 1970's: A New Approach*, U.S. Government Printing Office, Washington, D.C. 20402. Price: 30 cents.) asks for clearer separation of three categories of American foreign aid: (1) military assistance, (2) welfare and emergency relief, and (3) development assistance. It further recommends that the U.S. move away from programs built around AID missions involving large numbers of Americans working abroad and replace them with "four institutions dealing with development problems". AID's principal successors would be a U.S. International Development Bank and a U.S. International Development Institute. The Bank would provide "capital and technical assistance"; the Institute would "administer technical assistance programs not directly linked to projects financed by the Bank". The Task Force report calls for greater emphasis on R&D and for the U.S. to "assume a supporting rather than a direct role in international development". A brief history of AID and its problems is included.

7031. "AID and the World Environment", *International Science Notes*, Bureau of International Scientific and Technological Affairs, Department of State, Washington, D.C., no. 25, September 1970, p. 7. The Agency for International Development (AID), through a new Office of Science and Technology, has undertaken programs to assist developing countries in dealing with environmental problems associated with their progress. Examples of actions taken are (1) providing for specialists to advise AID and conduct on-site workshops to identify important environmental concerns (see Abstracts 7032 and 7033); (2) arranging for the Smithsonian Institution to assist host-country institutions in evaluating the effects of completed environmental programs; (3) arranging for review of the environmental aspects of proposed AID development loans by the Departments of Interior, HEW, and Agriculture; (4) conducting studies of the environmental aspects of AID-provided pesticides and formulating procedural guidelines for apprising host countries of the dangers, (5) requiring an assessment of environmental aspects of AID-financed studies, and (6) taking steps to establish consistent environmental policies among AID and other international development agencies.

7032. "International Environmental Programs", *News Report,* National Academy of Sciences, National Research Council, National Academy of Engineering, v. XX, no. 7, August-September 1970, p. 15. "An International Environmental Programs Committee has been established under the joint auspices of the Office of the Foreign Secretary of the National Academy of Sciences and the Environmental Studies Board of the NAS and National Academy of Engineering to represent American scientists in international environmental councils. The committee, chaired by Deputy NAS Foreign Secretary Thomas F. Malone, will serve as U.S. adherent to non-governmental scientific organizations concerned with problems of environmental degradation, will advise the Federal Government on international environmental problems, and will develop a clearinghouse for information on worldwide environmental problems. Executive secretary of the new committee is Henry J. Kellerman, former special assistant for environmental affairs in the Department of State."

7033. "The National Academy of Sciences Broadens Its Work in International Scientific Assistance", *News Report,* National Academy of Sciences, National Research Council, National Academy of Engineering, v. XX, no. 8, October 1970, p. 1. "Under an expanded contract with the U.S. Agency for International Development, the board [on Science and Technology of the NAS Office of the Foreign Secretary] will continue and expand its bilateral assistance programs now in effect with 10 countries . . . The bilateral programs have taken the form of workshops in which U.S. and foreign specialists analyze a developing country's resource base and scientific and technical needs and then recommend development steps . . . In the expanded program, . . . board panels will consider specific technical and policy questions – for example, questions dealing with new technologies and economic development – and will provide scientific and technical advice to U.S. assistance-program offices in Washington and abroad."

7034. "U.S. Scientific and Technological Agreements With Other Countries", *International Science Notes,* Bureau of International Scientific and Technological Affairs, Department of State, Washington, D.C., no. 25, September 1970, pp. 2-6. Agreements between the U.S. and other countries to cooperate in areas of science and technology are discussed. Advantages of formal agreements include (1) stimulation of cooperation which might otherwise not occur, (2) enhancement of the prestige of local scientists by calling government attention to the scientific community, (3) provision of added incentives for local financial support, (4) facilitation of exchange of scientific information and personnel, and (5) facilitation of exchange of materials and equipment. Details of a variety of cooperative programs by the U.S. and other countries are given. Described are agreements and projects undertaken with Japan,

Germany, India, Italy, Iran, Australia, the Republic of China, France, Spain, the USSR, and Romania. Scientific exchanges with Romania, Yugoslavia, Poland, and Czechoslovakia are promoted by the National Academy of Sciences and its counterparts in those countries.

7035. Kolcum, E. H., "U.S., USSR Set Joint Space Talk", *Aviation Week & Space Technology,* v. 93, no. 16, 19 October 1970, pp. 16-17. As a result of a suggestion by Soviet Ambassador Anatoli Dobrynin to Dr. Philip Handler, U.S. and Soviet spacecraft design experts were to meet in Moscow on 22-27 October to discuss joint space rescue capabilities. Diplomatic efforts preceding the arrangements are detailed. The author notes that "Russian sources . . . were considerably more open about the joint plan than their American counterparts". Principal items scheduled for discussion are (1) equipment-compatible approach and docking arrangements (considered most critical), (2) working groups to discuss technical problems, and (3) planning for future work. The U.S. may decide to use a common docking facility in Skylab, which will introduce some critical elements in design and operating techniques. Language barriers and common computer programs are not considered to be so difficult as "the mechanics of adapting two systems". Other international space rescue concepts are mentioned, including the unmanned lunar orbiting vehicle for emergency rescue (LOVER).

7036. "Expertise for Export", *Engineering News Record,* v. 185, no. 17, 22 October 1970, p. 21. A delegation of American architects, engineers, and contractors, led by the vice-president of the American Institute of Architects, toured Moscow, Novosibirsk, Tashkent, Samarkand, Sochi, and Leningrad from 25 September to 10 October to observe construction methods in the USSR. They were invited by the first deputy chairman of the State Committee on Science and Technology, D. M. Grishiani. Grishiani, the leading USSR specialist on American management theory, proposed the visit some months ago as preparation for possible USSR-American collaboration on the production of prototype housing, hospitals, and commercial buildings in the USSR. Official approval by both governments will be required before any official joint projects are undertaken. A Soviet delegation is planning a reciprocal visit to the U.S.

7037. "U.S. Scientists in Russia", *Science News,* v. 98, no. 12, p. 250. "For some years an exchange program has brought Russian Academicians to the United States and sent American scientists to the U.S.S.R. Dr. Frederick Barghoorn of Yale University sent questionnaires in 1966 and 1967 to scholarly visitors to Russia, and received 179 voluminous replies. The survey indicates that the exchanges have been valuable in a professional sense, but that work in Russia is frustrating and annoyingly controlled by government

overseers – particularly for social scientists. Dr. Barghoorn says the responses indicate that the more knowledgeable an exchangee is about a nonpolitical discipline, such as mathematics, the more likely he is to be able to compare notes with his Soviet colleagues. Knowledge of socio-political subjects, on the other hand, is likely to make it more difficult to establish and maintain useful relations with Soviet counterparts."

7038. "Concorde: American Veto?" *New Scientist,* **v. 48, no. 722, 8 October 1970, pp. 59-60.** The possibility of American "ecological imperialism" is discussed with relation to the supersonic transport (SST). The Council on Environmental Quality (CEQ), in operation since January 1970, "has already totally changed the eco-political situation in the United States" by requiring environmental-impact statements "on all legislative proposals, important policy decisions, and major executive actions". This could mean that if the CEQ determines that SST's present a clear environmental hazard, they would be banned in the U.S.; and foreign SST's, such as the Concorde, would not be allowed to land in the U.S. Without flights to and from the U.S., the Concorde would be "wildly uneconomic" and would doubtless be scrapped. Similar situations might develop with other pollution problems with the same consequences, and America "would, in effect, be setting herself up as the keeper of our environmental conscience". Scientists will welcome the "ecological commonsense, [but] to the politicians of developing countries it would seem like Yankee imperialism tricked out in new clothes".

7039. Brownlow, C., "Tight Budgets Spur U.S.-U.K. Collaboration", *Aviation Week & Space Technology,* **v. 92, no. 10, 7 September 1970, pp. 83, 85.** U.S.-U.K. collaboration in the design and manufacture of military-aircraft components as an economy move for both countries is discussed. Two major joint projects and several smaller ones that are under way are described. In each case, the British are supplying their superior technological knowhow in specific areas. The most advanced program is one in which Rolls-Royce (U.K.) and Allison (U.S.) collaborated to modify a British Aircraft Corp. turbofan engine and are producing the uprated TF41 version by the hundreds for use in the U.S. Air Force A-7D and Navy A-7E attack aircraft. In another joint effort, Hawker Siddeley (U.K.) and McDonnell Douglas (U.S.) are teaming up to supply 102 AV-8A Harrier V/STOL attack aircraft to the U.S. Marine Corps. Rolls and Allison also are working on an advanced V/STOL lift engine, with Britain funding Rolls' share of the project and the U.S. Allison's. Allison officials are optimistic over the potential for future collaboration on more advanced programs.

7040. "Italian Launch Team", *Science News,* **v. 98, no. 11, 12 September 1970, p. 225.** "The United States has frequently launched

satellites for other nations, but the roles are soon to be reversed. Italian space engineers will launch three satellites for the United States from the San Marco platform anchored off the coast of Kenya on the equator – one in November or December, one in the spring, and a third in the fall of 1971. Launching from this platform rather than from Cape Kennedy enables the National Aeronautics and Space Administration to use smaller, less expensive launch vehicles. The Italians, who have been trained by NASA, will use three four-staged NASA Scout rockets to orbit two small astronomy satellites and one small scientific satellite. These satellites will map celestial X-ray sources, look for celestial gamma-ray sources, and investigate electric currents in the magnetosphere, auroras, magnetic storms, and the acceleration of charged particles in the magnetosphere."

7041. "U.S.-Spanish Cooperation", *International Science Notes,* Bureau of International Scientific and Technological Affairs, Department of State, Washington, D.C., no. 25, September 1970, pp. 6-7. Particulars of a U.S.-Spain agreement effective 26 September 1970 are summarized. In the areas of education and science, the agreement calls for increased exchanges of personnel – scientists, teachers, researchers, and scholars. It also provides for further assistance by the U.S. in expanding the Spanish education system and training professors and researchers in advanced scientific disciplines. Cooperative efforts are specified in scientific programs for peaceful purposes, especially in exploration and use of space, civil uses of atomic energy, marine sciences, medical and biological sciences, pollution control, wildlife conservation, and urban and regional planning. Development of specific mechanisms for collaboration between research centers of the two countries and establishment of channels for defining, planning, and executing cooperative programs are cited in the articles of agreement as first-priority tasks.

7042. "Yugoslavs Appoint Science Attaché", *Science,* v. 169, no. 3950, 11 September 1970, p. 1062. A nuclear physicist, Milorad Mladjenovic, has been appointed as the first Yugoslavian science attaché to serve in the U.S. The appointment grew out of an agreement reached by Dr. Lee DuBridge and the Yugoslav government during DuBridge's visit to that country last September. The Serbian Science Assembly, of which Mladjenovic is a member, distributes the science budget voted by the parliament. All assembly members are scientists, half of whom are elected, one-quarter appointed by parliament, and one-quarter appointed by industry. Mutual interest in world environment and international exchange of information are factors behind the creation of the new post. The U.S. has had a science attaché in Belgrade for the past 2 years. The Ford Foundation, the Fulbright Program, and the National Academy of Sciences currently have science programs in Yugoslavia.

7043. "Peace and the Green Revolution", *Science News,* v. 98, no. 18, 31 October 1970, pp. 347-348. The Green Revolution in India and Pakistan, brought about by a dwarf, disease-resistant, fertilizer-responsive strain of wheat, is hailed as a revolutionary change in world food production. The developer of the highly productive new strain, Dr. Ernest Borlaug, received the Nobel Peace Prize for his work. Dr. Borlaug cautions, however, that the new strain only defers the collision between world food supplies and the growing population for about 20 to 30 years. During this time, it will still be necessary to bring population into balance with food production. The new strain resulted in wheat-yield increases in both India and Pakistan from 11 bushels per acre to about 50 bushels per acre on the average. Yields of 150 bushels per acre were reported in some areas. Contrary to some predictions, supposedly tradition-bound farmers were eager to try the new seed. Other benefits from the Green Revolution are improved balance-of-payments situations in grain-poor countries, and advances in industrialization.

7044. Chedd, G., "Hidden Peril of the Green Revolution", *New Scientist,* v. 48, no. 724, 22 October 1970, pp. 171-173. Genetic dangers of the Green Revolution and possible solutions are discussed. Genetic dangers arise from overbreeding to produce certain plant characteristics, all the while narrowing the genetic base (or "gene bank") on which the specialized breeds are produced. In the extreme case, a point will be reached where no more genetic variations are possible, and concurrent evolution of diseases specific to the limited-gene hybrids would result in global catastrophe. Field workers have observed that once-abundant wild forms of wheat – vast storehouses of genetic possibilities – are now extinct. Also, the extinction rate of these genetic banks is proceeding at an alarming rate. Genes that might protect varieties against yet-unknown and evolving plant diseases have been discarded along with their wild-variety carriers. Increasing efforts to collect disappearing species, improving methods of storing their seed, and allotting space to perpetuate their cultivation are urged. Without such measures, future improvements will be impossible since the necessary genetic resources will no longer be available.

NATIONAL DEFENSE

7045. "Authorization of Appropriations for Military Procurement and Other Purposes – Conference Report", *Congressional Record,* v. 116, no. 172, 1 October 1970, pp. S16921-S16943. This is a discussion of the resolution of differences between the Senate and the House regarding the $20 billion Military Appropriations Bill for FY 1971 (H.R. 17123). Of interest here is the fact that the conferees agreed on a total R&D budget of $7101.6 million, which is almost exactly

midway between the 7265.6 million approved by the House and the $6937.5 million recommended by the Senate, and $300 million less than requested by the Department of Defense. The Senate provision of a $625 million ceiling for independent R&D was deleted, but requirements were retained for advance agreements between the Department of Defense and IR&D contractors and for Congressional oversight of all military IR&D. The Mansfield Amendment in the FY 1970 act (Section 204), requiring defense R&D to have "a direct and apparent relationship to a specific military operation or function", was considered too difficult to apply to basic research. In the FY 1971 bill, the conferees agreed to change the words "direct and apparent relationship" to "in the opinion of the Secretary of Defense, a potential relationship". The House conferees gave qualified approval to a Senate amendment (Section 207) resolving that the Government should provide greater support to basic scientific research, "which is essential both to . . . national security and the solution of unmet domestic requirements" and that a larger share should be provided through the NSF.

7046. "Mansfield Amendment Cut Down", *Nature,* v. 228, no. 5267, 10 October 1970, p. 107. The political exchanges involved in the Congressional debate over extension of the Mansfield Amendment to the FY 1971 Military Appropriations Bill are discussed in this editorial. At the request of the House conferees, critical wording in the amendment, that no research project should be supported by the Department of Defense "unless such project or study has a direct and apparent relationship to a specific military function or operation" was replaced by "unless such project or study has, in the opinion of the Secretary of Defense, a potential relationship to a military function or operation". This was the price paid by the Senate for its insistence that Safeguard ABM's be used only for defending missile sites. Sen. Mansfield objected vigorously to the new wording, because he said it "affirmatively states that the Department of Defense will solely determine what research is beneficial to it". Another Senate-backed measure that came out much watered down in the compromise was the expected increase in NSF's FY 1971 budget, which the House conferees refused to act upon. The writer observes that "the whole question of science funding has now been thrown back into the political arena where it stands to be decided not on its own merits but as part of the tussle between the friends and foes of the Pentagon".

7047. Winston, D. C., "Conferees Agree on Limited ABM Scope", *Aviation Week & Space Technology,* v. 93, no. 14, 5 October 1970, pp. 20-21. Senate and House conferees agreed to limit the Safeguard ABM "to the protection of Minuteman offensive sites" and refused to authorize funds to deploy the ABM for the defense for population

centers. FY 1971 authorization for Safeguard now totals $984.4 million, which includes $334 million previously carried under military construction budgets. "House conferees emphasized that they consider large-scale expansion of the system to be open to future debate." Eleven authorization actions by the conferees on weapons systems are listed briefly. Three examples follow: (1) $30 million for procurement of an international fighter plane for use by friendly nations in Southeast Asia, (2) "Acceptance of Senate-approved restrictions on expenditure of $200 million by the Air Force for prior-year cost overruns on the Lockheed C-5A", and (3) "transfer of $79 million for the Lockheed S-3A anti-submarine warfare aircraft to the procurement account, reversing earlier Senate action which had authorized the money for research and development only".

7048. *ABM, MIRV, SALT, and the Nuclear Arms Race,* **Hearings Before the Subcommittee on Arms Control, International Law and Organization of the Committee on Foreign Relations, U.S. Senate, Ninety-first Congress, Second Session, 16 March, 8, 9, 13 and 14 April, 18 and 28 May, and 4 and 29 June 1970, 624 pp.** These hearings were directed toward bringing to light facts and expert opinions regarding the ABM (anti-ballistic missile), MIRV (multiple independent reentry vehicle), SALT (strategic arms limitation talks), and the nuclear arms race. Early sessions centered around the SALT talks and the pros and cons of Senate Resolution 211, asking that President Nixon seek an agreement with Russia to limit offensive and defensive strategic weapons and suspend test flights of reentry vehicles. Subsequent presentations covered the ABM, MIRV, U.S. relations with China, the Southeast Asia situation, verification of compliance with arms control agreements, and the desirability of funding Safeguard Phase II. The witnesses included Senator Brooke (originator of S.R. 211), M. Bundy (former Presidential Assistant for National Security Affairs), H. York and J. S. Foster, Jr. (former and current Director of Defense Research and Engineering, respectively), M. R. Laird (Secretary of Defense), S. D. Drell and M. L. Goldberger (former members of the President's Science Advisory Committee), and three former Presidential Science Advisors: G. P. Kistiakowsky, J. P. Wiesner, and D. F. Hornig. In his introductory remarks on 4 June, Senator Gore, chairman of the subcommittee said, "This is the most sophisticated subject on which the Congress has ever attempted a public hearing... A number of witnesses... have testified on the Safeguard ABM system and the deployment of MIRV. All of these witnesses, except... Secretary of Defense... Laird, have said that in their judgement expanding Safeguard and deploying MIRV would be at best unwise and unnecessary, and at worst damaging if not dangerous in the effect that such actions would have on the arms race and on negotiations in that vital area." However, subsequent testimony by Dr. Foster supported Secretary Laird's views. (For sale by the U.S.

Government Printing Office, Washington, D.C. 20402. Price: $2.75.)

7049. "Scientists and Senators against the Arms Race", *Nature,* v. 228, no. 5270, 31 October 1970, pp. 406-407. The activities and potential political force of two scientific lobby groups, the Council for a Livable World and the Federation of American Scientists (FAS) are discussed. Both groups were active in election support of various candidates, particularly in view of recent decisions affecting Federal funding of scientific activities. The ABM controversy, in particular, "has had an important effect on the scientific community itself, providing the stimulus to the formation of lasting activist political organizations and alliances through which concerned scientists could become more effectively involved in discussion of public policy". For various reasons, the National Academy of Sciences and other professional bodies find themselves unable to step openly into the political arena. However, "scientists as a group are probably more ready to be politicized than ever before" as a consequence of their decreasing prestige and increasing unemployment.

7050. "CBW Pact", *Science,* v. 169, no. 3950, 11 September 1970, p. 1057. "President Nixon has sent to the Senate the Geneva Protocol of 1925 which bars signatories from the first use of chemical or biological weapons in warfare. The President asked the Senate to ratify one formal reservation to the protocol to permit retaliatory use of chemical weapons; the use of biological weapons, however, was ruled out entirely. In the message to the Senate, the Administration says that the United States will not consider the protocol to prohibit the use of tear gas, herbicides, smoke, flame, or napalm; debate over this informal provision reportedly was the main cause of the 9-month delay between the President's announcement that he would submit the protocol for ratification and its actual submission. The United Nations General Assembly voted last December 80 to 3 that the Geneva Protocol did indeed ban the use of tear gas and defoliants."

7051. "Nixon Panel Urges Revamp of Defense R&D Management", *Industrial Research,* v. 12, no. 9, September 1970, p. 42. "Sweeping changes in how the Dept. of Defense performs basic research and develops military systems have been proposed by President Nixon's blue ribbon defense panel following a one-year study of the Pentagon's organization and performance... [The panel] concludes that a 'substantial portion' of the cost overruns, schedule slippage, and lack of performance in hardware acquisition programs can be attributed to a multitude of management deficiencies. Accordingly, the panel recommends that R&D, and test and evaluation programs be placed under separate assistant secretaries of defense to cut duplication and blind spots towards program weaknesses." The panel

further recommends "that the Advanced Research Projects Agency be given the responsibility for control of all research which would expand the technological base" and for evaluation of all DoD research at military laboratories, contract research establishments, and federally sponsored 'think tanks'. On the basis of this evaluation, an annual research plan would be submitted for approval." Some members of the Joint Chiefs of Staff and the Congressional Armed Services Committees object to the proposed reorganization on the grounds that it gives civilians too much control over the military.

7052. "NAS-AAAS to Report on Vietnam Defoliation", *Nature,* v. 228, no. 5267, 10 October 1970, pp. 108-109. This article discusses the defoliation and crop-destruction programs carried out in South Vietnam by the Department of Defense since 1961. The military procurement authorization bill requires the DoD to enlist the National Academy of Sciences to conduct a survey of the program's physiological and ecological effects. In a pilot study by an American Association for the Advancement of Science team and Vietnamese scientists, the samples and field data collected could not be correlated with spraying missions because the DoD refused to provide the dates, locations, and natures of all missions flown. However, ecological effects are apparent. Extensive areas of dead forest are being invaded by bamboo, and sprayed mangrove swamps are not regenerating. Biological samples brought back by the AAAS group may provide information on the distribution and hazards of residuals from the herbicides sprayed extensively over Vietnamese croplands and forests – particularly of a highly poisonous dioxin compound that was present as an impurity in the herbicide 2,4,5-T (no longer in use). As pointed out by the writer, the herbicide programs are having an impact on the local society that is probably more irreversible than their effects on the ecology.

7053. "Herbicides in Vietnam", *BioScience,* v. 20, no. 19, 1 October 1970, p. 1070. "An attempt to ban the use of herbicides either for clearing ambush areas around trails, roads, and canals or for destroying food crops used by Communist forces in Vietnam was defeated in the Senate by a vote of 22-62 during the last week in August. Senators Goodell and Nelson attempted to prevent Army use of herbicides by attaching an amendment to the Defense Procurement Act. Senator Thomas McIntyre defended the use of herbicides . . . 'for the protection and safety of the American fighting man'."

8000 MULTINATIONAL SCIENCE POLICY

WORLD ENVIRONMENT

8132. Daddario, E. Q., "Creation of a World Environmental Institute", *Congressional Record,* **v. 116, no. 166, 23 September 1970, p. E8539.** In this speech, Congressman Daddario introduces "a House resolution calling for the creation of a world environmental institute and the support of this concept by the U.S. delegation to the U.S. Conference on the Human Environment in 1972". He points out that environmental management cannot be successful without international agreement because actions taken in one area can affect the environment far away. The hope is expressed that a pattern for a world environmental institution will be developed promptly by existing bodies like the Scientific Committee on Problems of the Environment (SCOPE) of the International Congress of Scientific Unions, or by the Committee for International Problems of the National Academy of Sciences.

8133. "The Global Pollutants", *Technology Review,* **v. 73, no. 1, October/November 1970, p. 58.** MIT's Study of Critical Environmental Problems (SCEP), to be published in volume form this spring, is called the first step in the discipline of "global pollution watching". Three areas of major concern are outlined by the report: (1) atmospheric pollutants having possible climatic effects, but little worldwide ecologic effects; (2) marine pollutants (e.g., persistent chlorinated hydrocarbons, toxic heavy metals, and nutrients) of damaging or potentially damaging effects; and (3) high-level radioactive wastes. The SCEP study group recommended to the AEC "that an independent, intensive, multidisciplinary study . . . be made of the trade-offs in national energy policy between fossil fuels and nuclear sources, with a special focus on problems of safe management of the radioactive by-products of nuclear energy, leading to recommendations concerning the content and scale and urgency of needed programs". The implication is that such a study might show that nuclear power generation could bring worse problems than the ones we're now facing with fossil fuels.

8134. McCaull, J., "Who Owns the Water?", *Environment,* **v. 12, no. 8, October 1970, pp. 30-39.** The author points out that efforts to control the use and pollution of rivers is complicated by the fact that water systems cut across national, regional, and state boundaries, and that present legal provisions are incompatible with systematic water management. Selected national and international control measures are described. It is concluded that these measures are ineffective for many reasons, one of the strongest being that the responsible agency does not have the necessary legal authority. Pollution studies by

international bodies such as the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) of the United Nations have not generated any comprehensive control legislation. "The lack of voluntary cooperation among countries is not confined to Europe, the United States, and Canada. No meaningful cooperative efforts in pollution control have developed among Russia and the Eastern European countries. Efforts there have been limited to the exchange of information and to joint surveys, without further commitments to comprehensive control measures." Hungary uses fines as a deterrent, the amount of the fine for each pollutant being based on the amount of biological damage it will do in the water and the cost of treating the water to neutralize it. The author points out that such a system is easier to establish in a socialist country where political and legal powers are centralized. Indeed, the first year of the new rules in Hungary produced a sharp rise in the number of industries ordering the construction of waste-water-treatment plants. However, since 95 percent of Hungary's rivers and streams originate outside the country, even the Hungarian National Water Authority recognizes that the key to the preservation of water resources lies in international cooperation on the basis of entire natural basin systems.

8135. **Chapman, P., "Energy Production – a World Limit?", *New Scientist,* v. 47, no. 720, 24 September 1970, pp. 634-636.** An analysis of world power-production needs and forecasts is given and underlying assumptions are identified. The author challenges the assumption that energy production can increase indefinitely. Calculations based on a few admittedly arbitrary assumptions are presented to show that a ceiling must be placed on the total rate of energy production that is not included in the earth's natural thermal equilibrium. (Today over 90 percent of the world's energy production comes from nonequilibrium sources.) Otherwise, the resulting temperature rise will have serious ecological consequences. In the absence of necessary information for specifying an exact upper limit, the author suggests 5 percent of the total solar input as an arbitrary limit to serve as a basis for the energy policies of individual nations. Such a global limit implies that power consumption must eventually level off, and it can be shown that this in turn means that world population must level off. According to the writer, the hope that nuclear-power production would be a panacea is based on the fallacious assumption that energy production could increase indefinitely. Since the sun's energy is already included in the earth's natural thermal equilibrium, it is suggested that we embark on a vigorous R&D program into the extensive use of solar power as a means of extending energy supplies.

8136. "Law of the Sea and the Draft Seabed Convention", *International Science Notes,* **Bureau of International Scientific and Technological Affairs, Department of State, Washington, D.C., no. 25, September 1970, pp. 9-10.** A summary is presented of the U.S.-submitted Draft United Nations Seabed Convention to provide a foundation for peaceful exploitation of seabeds for mankind's benefit. The President's recommendations in the working paper provide for the following: (1) limitation of national claims to seabed natural resources "to an area landward of a depth of 200 meters", (2) "substantial payments derived from seabed exploitation outside the 200-meter limit to be devoted to international community purposes, particularly economic assistance to developing countries", and (3) establishment of an international legal framework for administration of seabed-resource exploitation outside the 200-meter limit. The proposed authorization mechanism is to have coastal nations act as trustees in administering exploitation of seabeds out to their continental margins, and to set up international machinery for authorizing operations beyond the continental margins. The President has asked other nations to "join in an interim policy designed to assure that exploration and exploitation of the deep ocean floor continues", pending ratification of a treaty.

8137. Borgese, E. M., "The Prospects for Peace in the Oceans", *Saturday Review,* **v. 53, no. 39, 26 September 1970, pp. 15-22.** The "Pacem in Maribus" convocation at Valletta, Malta, is reviewed. Existing regional agreements are discussed in the review, and it is concluded that certain territorial rights can continue to be respected. However, international regulation has no legal precedent and requires an innovative approach. Marine researchers often find themselves caught between commercial and military interests. Areas in which it is imperative to set priorities were defined by a speaker as (1) extraction of mineral versus living resources, (2) determination of which living resources to harvest, (3) evaluation of comparative methods of resource extraction, and (4) development or nondevelopment of new technologies (especially where new technologies may be harmful or interfere with other seabed uses). While no formal action was taken by the convocation, the closing statement emphasizes the need for establishing a multidisciplinary study group and a "working system for the impending ocean regime".

8138. Borgese, E. M., "The U.S. Seabed Treaty Proposal: Reaction at Malta", *Center Report,* **v. 3, no. 4, Center for the Study of Democratic Institutions, October 1970, pp. 3-4.** Interpretations of the U.S. Draft Seabed Convention are discussed and the consensus summarized: (1) the proposed treaty neither gives anything new to the coastal states, nor takes anything away from them, (2) coastal states

are free to exploit seabeds of their continental margins as far as their technologies will permit, (3) "it satisfies the demands of the oil companies for the widest practicable national jurisdiction" and provides a "trusteeship zone that would not be subject to any international enforcement machinery", and (4) though the proposal provides for royalties to be paid to an international organization, its conditions are far too restrictive to be accepted by the international community. The author proposes an interim *ocean development tax* of 1 percent on ocean produce to be paid on a voluntary basis to an international body of "representatives of all specialized agencies of the United Nations engaged in the exploration and exploitation and conservation of the ocean environment". This proposal (1) "would not prejudice the question of boundaries eventually to be established", (2) "would yield revenue *now*", regardless of further technological progress, and (3) "would transcend the concept of aid to developing nations".

8139. "Continuing Ocean Policy Research Group Established", *Center Report,* v. 3, no. 4, Center for the Study of Democratic Institutions, October 1970, p. 4. Harry Ashmore, Center president, outlined the functions of a new "multinational, multidisciplinary, nongovernmental" Continuing Group for Policy Research as proposed by the Steering Committee of the convocation at Malta: (1) systematic interpretation of existing information, especially with regard to pollution and ecological disruption; (2) examination of long-range (50 years) consequences of human action on ocean ecology in relation to planetary ecology, and (3) "assembly, analysis, and collation of information provided by the biological and social sciences, and other appropriate disciplines, as it bears upon the narrow legal questions of ocean boundaries and related matters". It is recognized that an innovative approach is necessary to cope with the issues raised by pollution of the oceans, development of ocean resources, and the economic needs of the developing countries.

8140. Eichelberger, C. M., "Treading Water", *Saturday Review,* v. 53, no. 39, 26 September 1970, p. 24. The failure of the United Nations Committee on the Seabed to adopt a set of principles at its Geneva meeting for the negotiation of an international seabed treaty is attributed to what seemed like deliberate blocking tactics by the Soviet Union and several Latin American countries. For example, the Soviet delegates quibbled about wording of the "peaceful-purposes" concept; they objected to the sharing of revenues from the seabed with developing nations; and they objected to an international seabed administrative authority. Some Latin American delegates objected to "internationally agreed territorial boundaries with national jurisdiction"; the Brazilian delegate contended that each state should determine its own territorial limits. While there was appreciation for U.S.

initiative in preparing the working draft, few delegates would be willing to accept it without change. It may be possible for the UN to formulate an acceptable "international regime and the international authority to implement it without delay", which should facilitate subsequent agreement on principles and, ultimately, on a treaty.

8141. "International Control of Seabeds", *BioScience,* v. 20, no. 20, 15 October 1970, p. 1116. "The United States has submitted a proposal to the United Nations which calls for the establishment of a new international agency to supervise the removal of resources from the ocean floors" (see Abstract 8136 for provisions). The proposal is a "working paper for discussion purposes". Some objection has been raised to the "automatic payment" of part of the royalties "from leases beyond the 200-meter depth . . . Some officials object because the proposal would establish an international organization potentially so vast as to make the size of the United Nations pale by comparison. But the opposition of the Soviet Union . . . and the disapproval by France and Great Britain of the broad powers granted in the U.S. proposal make the outlook for a seabed treaty this year highly unlikely."

8142. "Deep-Sea Mining", *New Scientist,* v. 47, no. 719, 17 September 1970, p. 581. Article III of the Seabed Draft Declaration governing seabed activities beyond the limits of national jurisdiction calls for three governing bodies: an international registration agency, an international mining supervisory agency, and an ocean floor tribunal to control future mining of seabed resources in international waters. The registration agency "would be purely administrative, maintaining a register of ocean floor mining claims of interested states. The international mining supervisory agency would supervise the implementation of international regulations governing the protection of other recognized users of the high seas, the safety of the high seas and the prevention of waste of mineral resources . . . The ocean floor tribunal would settle disputes resulting from interpretation and application of the rules governing mining activities on the ocean floor." According to Article VII of the draft declaration, surface rentals and annual royalties would be paid by countries engaged in ocean-floor mining, and these monies would go into a special fund under international administration.

MULTINATIONAL SPACE ACTIVITIES

8143. White, I. L., *Decision-Making for Space: Law and Politics in Air, Sea, and Outer Space,* Purdue University Studies, Lafayette, Ind., 1970, 304 pp. ($6.50). This book attempts "to determine if a core of principles exists in international law which may be applied to the legal problems likely to be encountered in outer space . . . The author maintains that knowing the preconditions of acceptance of air and

sea law should help in predicting which laws will be accepted in the space environment. The author first determines and categorizes the legal problems of outer space, selecting twenty-two for analysis. Then he discusses certain legal rules and principles in international air and sea law. In the book's final section, he analyzes why national decision-makers have accepted these principles and whether these rules will be applicable to legal problems in outer space."

8144. **Hager, D. R., "The Orbiting Junkyard", *Saturday Review*, v. 53, no. 36, 5 September 1970, pp. 44-46.** Space debris, accidentally reentering the earth's atmosphere undamaged, is discussed and possible solutions to the resulting hazards are presented. As space technology becomes more refined, it is expected that more equipment will be capable of undamaged reentry, presenting hazards to persons and property and perhaps even triggering an "accidental war". Recorded incidents of this type are described and two recommendations for action are offered: (1) governments should employ their technological skills to perfect methods of removing, disposing of, or salvaging, space debris, and (2) "an effective system of international law for protection against the effects of re-entering space debris" must be established. Action must surpass the "generalities" of the 1967 Outer Space Treaty "which makes a state internationally responsible for the effects of its space activity". Agreements must include a concept of liability, limits of compensation, definitions of damage and injury, and methods of enforcement.

8145. **"Europeans Push Unified Space Agency", *Aviation Week & Space Technology*, v. 93, no. 18, 2 November 1970, pp. 17-18.** Two major objectives of the November session of the European Space Conference in Brussels are discussed: (1) to decide whether to proceed with plans to participate in the U.S. space station/shuttle program, and (2) to obtain agreement on the structure and long-range program of a new European Space Organization (ESO). The new, unified agency would combine the European Space Research Organization (ESRO), European Launcher Development Organization (ELDO), the European Conference on Telecommunications Satellites (CETS), and the European Space Council (ESC). Main objectives of ESO would be (1) to develop a long-term European space policy and coordinate it with other national and international programs, (2) to establish a European industrial capability that will be competitive in European and world markets, and (3) to conduct coordinated programs in "scientific research, applications satellites, launchers and technological research". Proposed methods of supporting the ESO through financial contributions of member nations, along with budget procedures, are described. Companies in member countries will be encouraged to form international consortia to facilitate efforts toward achieving the above objectives.

8146. Fink, D. E., "Europeans Back Space Cooperation", *Aviation Week & Space Technology*, v. 93, no. 14, 5 October 1970, pp. 17-18. At the Fourth Eurospace Industrial Conference in Venice in September, European government, industry, and space organization officials indicated interest in participating in NASA's post-Apollo program, saying that it "was an opportunity Europe could not afford to miss". Funding through U.S. prime contractors would entail changes in European budgeting practices, since European governments "presently channel aerospace development money through their own industries". A minimum level of 10 percent of the $10 billion program would be expected from European governments. "U.S. officials stressed the importance of Europe's participation beyond the 10 percent level, if Europe wanted full access to technology in the total program."

8147. Kolcum, E. H., "International Space Station Plan Pushed", *Aviation Week & Space Technology*, v. 93, no. 15, 12 October 1970, pp. 18-19. Delegates to the 21st International Astronautical Federation congress in Konstanz, Germany, discussed an Orbiting International Laboratory (OIL) program, broader than NASA's post-Apollo program, open to all nations who wish to participate. Legal and organizational problems were listed as (1) "selection of an international crew", (2) "agreement on a comprehensive set of legal questions", and (3) "development of a management organization". The article presents details of these problems. It is noted that the project would need "solid objectives, valid financial estimates, a fair return in contracts for participating countries and a strong internal structure".

8148. "Space Applications Launch Talks Expected Soon on Draft Pact", *Aviation Week & Space Technology*, v. 93, no. 14, 5 October 1970, p. 18. Representatives of the European Space Conference (ESC) and the U.S. State Department negotiated the final draft of an applications satellite launch agreement for presentation to the Europeans. The agreement provides "that if an international agency, such as Intelsat, decided a future European satellite represented a conflict, NASA still would consider its launch on an individual basis". This concession puts the initiative for starting post-Apollo negotiations on the Europeans by removing "the only major roadblock to talks". The second session of the ESC is expected to approve the talks. Europeans feel they could not give full support to both NASA's program and the Europa 3 development. However, some officials believe that "Europa 3 development should be continued as a hedge against possible cancellation or reduction of NASA's post-Apollo effort".

8149. "Space Rescue Parley", *Aviation Week & Space Technology*, v. 93, no. 15, 12 October 1970, p. 19; and "U.S., Soviet Agreement",

Aviation Week & Space Technology, **v. 93, no. 18, 2 November 1970, p. 21.** These two brief articles note the meeting of Soviet and American space scientists "to begin adopting standard components and systems adaptable for space rescue". An agreement on "specific elements of rendezvous and docking for further technical discussions on compatible systems was signed in Moscow". Three working groups of three to five members from each country will be appointed to discuss specific topics (e.g., rendezvous and docking procedures, hardware and approach requirements). Future meetings will be held alternately in the U.S. and the U.S.S.R. to "set common requirements" and "discuss means of adapting spacecraft to meet them".

8150. "Joint Venus Proposal Discussed", *Aviation Week & Space Technology,* **v. 93, no. 17, 26 October 1970, p. 24.** "Range of U.S.-Soviet cooperative space projects being discussed includes a plan to coordinate launch of unmanned payloads to Venus. The joint program, which also could involve France, would include a lander vehicle which would dispense balloons in the Venusian atmosphere and an orbiting vehicle which would interrogate sensors carried by the balloons. U.S.'s National Aeronautics and Space Administration would develop and launch the orbiter, and the Soviets would build and launch the lander portion. French space agency (CNES), . . . would provide the balloon package for the lander vehicle . . . The project is still in the preliminary discussion stage, and is an outgrowth of contacts between space scientists from the three nations at the recent IAF meeting in Konstanz, West Germany. Detailed plan for U.S.-Soviet cooperative manned missions came from the meeting."

8151. Rockwell, W. F., Jr., "Space: The International Approach", *Congressional Record,* **v. 116, no. 178, 9 October 1970, pp. E8998-E9000.** In this speech before the Canadian Club of Toronto, Mr. Rockwell, chairman of the board of North American Rockwell Corp., reviews the history of the U.S. space program and stresses the desirability of continuing to explore space and of international cooperation in future space ventures. "To erode the U.S. space program, as the cutbacks in the budget are doing," says Mr. Rockwell, "threatens the technological future of the United States and its capabilities to cope with environmental problems". He then points out that NASA has been directed by Congress to cooperate with other nations for mutual benefit, with each country bearing its own costs. Examples of existing cooperative space programs with Canada, England, Germany, Italy, France, India, Norway, Sweden, Argentina, and Brazil are cited. The three major space efforts under way are (1) continuing moon exploration; (2) development of an earth-orbiting, manned space station (scheduled for the late 1970's); and (3) development of a reusable space shuttle. North American Rockwell is negotiating with firms in England (British Aircraft

Corporation), West Germany (Messerschmitt-Boelkow-Blohm), and France as working partners on the space shuttle program, each company to be funded by its own government (see Abstract 8153).

8152. Elson, B. M., "Other Nations to Use Space Station", *Aviation Week & Space Technology*, v. 93, no. 13, 28 September 1970, pp. 50-56. The projected U.S. space station/shuttle is described and organization, financing, and management of the project are discussed. Prime assumption is that the U.S. is trustee of the facility that would serve national and international interests and would "be available to academic, commercial and governmental organizations to further scientific research or more practical pursuits, including commercial operations". NASA would be responsible for seeing that users adhered to "the principle of peaceful use of outer space and for assuring that the end results of all station activities are fully and openly documented". Financing of programs would be the responsibility of the group or nation proposing the research, and proposals would be selected by NASA "on the basis of merit, feasibility, safety and compatibility with other station activities". The article includes general outlines of prerequisites and priorities of station use, and a summary of information publication requirements. NASA is revising and enlarging the Space Program Advisory Council (SPAC) to encourage and facilitate "maximum involvement of potential space station users". NASA is also soliciting ideas on space station uses, support requirements, management structure and utilization policies, and related topics. Address communications to Samuel H. Hubbard, NASA Headquarters, Code MF, Washington, D.C. 20546.

8153. "British, Germans Pay for Space Shuttle Work", *Industrial Research*, v. 12, no. 10, October 1970, pp. 29-30. "Firms from Britain and West Germany have been selected to help study and design the next manned space vehicle planned by the United States – the space shuttle. This agreement marks the first time that non-American organizations have had such a role in the U.S. space program.... Both London and Bonn have agreed to pay for the participation of the companies picked from their countries – the British Aircraft Corp. of Bristol and Messerschmitt-Boelkow-Blohm of Munich, respectively. NASA reports that the value of each contract is about $500,000. BAC and Messerschmitt will be joining the space shuttle study team led by North American Rockwell Corp.'s Space Div., Downey, Cal., and General Dynamics Corp., San Diego, Cal.... NASA officials are hopeful that the building phase, which will require approval from Congress, will start next year so that the first flight can be made in 1976. Now that the ice has been broken, space observers see the possibility that foreign money and talent could be used in fabricating the shuttle, thus easing the burden of the financially strapped space agency."

8154. d'Arcy, J., "Challenge to Cooperation", *Saturday Review,* v. 53, no. 43, 24 October 1970, pp. 24-25, 72-73. The problems of broadcasting via satellite are discussed. In view of fears, especially on the part of smaller developing nations, that superpowers will use satellite communications systems for propaganda purposes, the author emphasizes the urgent need for rules and principles to facilitate the free and open flow of information. He points out that rules of journalistic professionalism, rather than political dogmatism, should govern international communication. Also, satellites should be owned by intergovernmental regional agencies, but programs should be the responsibility of nongovernmental organizations established by the broadcasting organizations of the regions. A new approach must be taken, he says, to supplant outdated concepts of territorial broadcasting. The world regulatory body, the International Telecommunication Union (ITU), must do more than reconcile "conflicting views and demands of national administrations". Also, it is imperative that the United Nations have a highly reliable communications system to implement its peacekeeping operations.

8155. Johnsen, K., "Intelsat Agreement Awaits Procurement Policy Draft", *Aviation Week & Space Technology,* v. 93, no. 15, 12 October 1970, pp. 21-22. The intersessional working group of the 70-nation International Telecommunications Satellite Consortium (Intelsat) completed a tentative draft of a working agreement which would phase out U.S. Communications Satellite Corp. (Comsat) as Intelsat's manager. The intent of the agreement is to promote international competition on the basis of quality, cost, and delivery date, and to prevent single-state voting monopoly. (U.S. Comsat presently has a voting strength of 52%). Details of the procurement policy for inclusion in the agreement are still being worked out. Intelsat's governing board will be instructed to promptly (1) "negotiate a six-year contract with Comsat for continued technical and operational management", (2) "appoint a secretary general to oversee Comsat's performance under the contract and report to the board", and (3) "initiate a study on the organization of Intelsat management under a director general". Both Comsat and the secretary general would ultimately be replaced by the director general as chief executive of the governing board.

8156. "SPADE Works for Easy International Satellite Links", *New Scientist,* v. 48, no. 724, 22 October 1970, p. 176. Intelsat's SPADE demand-assignment communications system, approved for operational use earlier this year, is discussed briefly. "The great attraction of the SPADE system is that it will allow any two Earth stations to establish a link when they want to. It will be especially valuable in

regions where there is not enough traffic to justify a permanent link." In this system, the satellite's working band forms a "pool" of single voice channels each of which can be made available to any earth station on demand. The latest terminal equipment offers a "flexible and efficient operating method for the satellite user". It is anticipated that this type of service will be needed when Intelsat IV begins Atlantic-region operations in 1971.

8157. "Atlantic Satellites", *Science News*, v. 98, no. 11, 12 September 1970, p. 225. "There is at present no method for air traffic control over the oceans; radar capacity extends only 200 miles. This means that aircraft traveling from the United States to Europe over the Atlantic, or to Asia over the Pacific, are regulated by assigned and different flying altitudes. Until now, this has been sufficient to avoid collisions in mid-ocean. However, with oceanic air traffic increasing, the Federal Aviation Administration and its European counterpart, with cooperation from the National Aeronautics and Space Administration and the European Space Council, are studying the use of air traffic control satellites over the Atlantic. Both space agencies are already committed to the development; the implementation is now awaiting FAA action. Such a development would give impetus to use of satellites in synchronous orbit for all air traffic control."

8158. "Information Goes International", *Chemical & Engineering News*, v. 48, no. 42, 5 October 1970, p. 38. General Electric's international information processing network, GEN, after an investment of $100 million, "is now on line in 42 metropolitan areas", with planned expansion to over a hundred additional cities by the end of 1971. GEN has been extended successfully to London by COMSAT satellite. Further international expansion of GEN "will be centered in Europe but . . . preliminary spadework is also being done in the Far East". The growing wave of crude petroleum prospecting in Southeast Asia and South America could provide an international market for GEN to estimate "the profitable payout time for oil wells" and for "centralized data processing for international refinery operations".

COOPERATIVE AIRCRAFT PROGRAMS

8159. "MRCA Consortium Planning Family of Military Aircraft", *Aviation Week & Space Technology*, v. 92, no. 11, 14 September 1970, p. 18. "Three major European companies will design a strike fighter/trainer as the first step in a sweeping plan to develop a family of military aircraft concepts for both domestic and export markets. The initial design is called Pannap, for Panavia new aircraft project, and is a follow-on to Panavia's multi-role combat aircraft (MRCA). Shareholders in Panavia are British Aircraft Corp., Fiat, and Messerschmitt-Boelkow-Blohm. Other companies, including those

from the U.S., could be invited to participate in the design studies . . . A.H.C. Greenwood, Panavia chairman and deputy managing director of BAC, said . . . that Panavia's shareholders will finance this initial design work with company funds." There is some question of the Italian government's backing of Fiat and Aeritalia ("the newly consolidated Italian aerospace company"). "Pannap represents the first time in the post-World War 2 period that a German company is investing more than token funds of its own in a project. The German government recently told its aerospace industry that it will have to depend less on government support than it has in the past."

8160. Coleman, H. J., "A-300B Airbus Picks Up Momentum", *Aviation Week & Space Technology*, v. 93, no. 16, 19 October 1970, pp. 28-31. The European A-300B airbus has reached a development point at which delivery dates can now be anticipated and negotiated. The program involves personnel in four countries (Germany, France, England, and The Netherlands), and the first flight prototype is scheduled for November 1972. Airworthiness certification is expected in January 1974. United States is the principal sales target, and U.S. orders are considered "a necessary breakthrough". Designers have aimed at standardization with McDonnell Douglas' DC-10 and Boeing's 747. Deutsche Airbus is covered by a $125 million credit guarantee by the German government; Aerospatiale SNIAS, the French industrial group, has similar backing from the French government. Hawker Siddeley Aviation (wing contractor) has invested $23 million in company funds, and it is hoped that the British government will rejoin the A-300B project. VFW-Fokker in The Netherlands was brought in on wing design, "with the Dutch government investing $20 million in the program . . . Total A-300B market is expected to exceed 400 aircraft", and the "group already is expanding its tactical horizons beyond the airbus".

INTERNATIONAL SCIENCE ORGANIZATIONS

8161. "Atlantic Treaty Association Report", *Congressional Record*, v. 116, no. 177, 8 October 1970, pp. S17465-S17466. This report, adopted at the 16th General Assembly meeting of the Atlantic Treaty Association in September, deals with urgent concerns of the Atlantic Alliance. In it "the Assembly welcomes the creation of NATO's Committee on the Challenges of Modern Society" (CCMS) and "recommends that CCMS continue and expand its scientific investigations to include data collection projects; that it encourages member countries to seek common programs and to work toward multinational solutions to problems in so far as practicable, in order to minimize discriminatory consequences in domestic and international trade and to achieve improved environmental quality goals; and

further that CCMS coordinates and cooperates with other international organizations to minimize duplication of effort and to maximize the initiation of action programs in the shortest possible time".

8162. "ISF Gains Support at Pugwash Conference", *Chemical & Engineering News*, v. 48, no. 39, 14 September 1970, pp. 26-30. Dr. R. Revelle, who conceived the idea of an international foundation "to promote scientific research and education in developing countries" presented goals and history of the International Science Foundation (ISF) at the Stanford pre-Pugwash Conference on Science and Development. ISF is not yet "an existing organization" and obstacles to its becoming one are manifold: (1) it would require an estimated $5 million to get ISF started, and the funding must "not be tied to any one government or ideology"; (2) "there is a growing tendency . . . for developing countries to actively oppose aid from developed countries and even from international organizations"; and (3) "developed countries themselves are increasingly reluctant to engage in any kind of organization that has international implications and spheres of influence". ISF would provide funds for younger university scientists in developing nations for relevant (to the nation) research in basic and applied science and for limited technical assistance to research workers. It would also encourage groups of scientists "to submit joint proposals for research in a defined field to create essential nuclei for future centers of excellence and projects of particular relevance to developing countries".

8163. Cade, J. A., "The International Institute for the Management of Technology", *The OECD Observer*, no. 47, August 1970, pp. 44-49. The research leading to the establishment of the International Institute for the Management of Technology in Milan is presented and the course work is described. The committee that did the preliminary study for the Institute concluded that the important question was that "of handling science and technology to the better advantage of the society or societies creating it", and that the principal concern was with "the management of science and technology in both the industrial and government sectors, using the term management in the widest sense". Studies and identification of key areas in management science and personnel are discussed as they relate to the purposes of the Institute. The Institute will bring together industry, government, and scientists from all countries to participate in joint activities, and will be "concerned primarily with the management of technology and technological innovation". Training programs in modern management are expected to be more comprehensive and more highly integrated than any presently existing management training programs. "A central part of the Institute's policy will be to strengthen collaboration between the industrial,

government and university sectors." Also, "there will be no restrictions as to nationality of those who teach, work or learn at the Institute". Gross operating costs are expected to be $1.5 million the first year, $2.3 million the second year, and $3 million in the "third and subsequent years". Methods of funding and participation by member governments and industry are also discussed. Course work is expected to begin in the spring of 1971.

8164. "Work of the European Nuclear Energy Agency", *Science Policy News*, v. 2, no. 2, September 1970, pp. 17-19. Development, regulatory, and information programs of the European Nuclear Energy Agency (ENEA) are discussed. Three joint projects in applied technology are described: (1) the Halden boiling heavy-water reactor project (Norway), (2) the Dragon high-temperature helium-cooled reactor project (Winfrith, U.K.), and (3) the Eurochemic fuel reprocessing company (Mol, Belgium). The Agency also established the European-American Nuclear Data Committee, which reviews "world developments in nuclear data measurements, . . . and recommends priorities for new measurement work". The Neutron Data Compilation Center collects, classifies, and stores in a "computer-controlled electronic filing system" neutron data from all parts of the world. ENEA has participated in the development of regulations concerning health, safety, and transport of radioactive materials. Mandates for continuance of major technological projects and data centers have been approved and "requirements for other specialized services . . . are under study".

8165. Irwin, M. R., "The International Union of Biological Sciences", *BioScience*, v. 20, no. 20, 15 October 1970, pp. 1113-1120. The history of the International Union of Biological Sciences and a description of its activities are presented. "Organizationally, the IUBS consists of four divisions – botany, general biology, microbiology, and zoology . . . IUBS functions importantly in international communication in science through congresses, symposia, and other types of meetings." One contribution to improved international communication was the organization of the Association of European Editors of Biological Periodicals. Biological control is another important area of activity, carried out largely in Western Europe by the Organisation Internationale de Lutte Biologique (OILB). Plans are being made to expand this function geographically. The IUBS has been active in dealing with biologically oriented problems of society, fostering the 58-nation International Biological Program and beefing up its Section of Ecology through the formation of the International Association of Ecology (INTECOL). The U.S. National Academy of Sciences has formed the U.S. National Committee of the IUBS to serve as liaison agent between the Union and the American biological community. The Committee is seeking advice from U.S. biologists on mechanisms for fulfilling its role most effectively.

8166. Hedén, C.-G., "A Professional Verdict over BW", *New Scientist*, v. 47, no. 718, 10 September 1970, pp. 518-520. The Fourth International Congress of Microbiology passed a comprehensive resolution against work on biological warfare (BW) and recommended that all microbiologists throughout the world do everything in their power to prevent its exploitation. It was also recommended that UNESCO be requested by the International Council of Scientific Unions (ICSU) "to organize an international conference on ethics in science and the protection of scientific manpower". Problems in semantics with regard to military, scientific, and political codes are discussed in this article, and the full text of the resolution adopted by the Congress is presented.

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9000 SCIENCE POLICY ABROAD

AUSTRIA

9001. "Third Federal Report on Research", *Science Policy News,* v. 2, no. 2, September 1970, p. 19. In its First Report on Research, the Austrian Government proposed to increase its research expenditures to 1.5 percent of the GNP by 1976 (from 0.61 percent in 1966). The Third Report on Research gives estimated 1970 research expenditures as only 0.68 percent of the GNP, which means that annual spending on research will have to increase by a factor of 5 in the next 6 years if the target is to be met. The increase between 1969 and 1970 is predicted to be a mere 12 percent. The Report gives details of proposed priority areas in the various research sectors. Short-range goals demand rapid conversion of research expenditures into economic growth.

BELGIUM

9002. "Science Budget for 1970", *Science Policy News,* v. 2, no. 1, July 1970, pp. 6-7. Extracts are presented from a statement by the Minister for Science Policy and Planning concerning 1970 science appropriations. The 1970 science budget, over B.F. 13,300 million ($2,660 million), is 4.1 percent of the total Belgian government budget and 13 percent over the 1969 science budget. Over half of this (B.F. 7,315 million) is for *university teaching and research,* and is being doled out through various Ministries and the Fonds National de la Recherche lscientifique (FNRS). Other beneficiaries are (1) *industrial and agricultural research* (B.F. 2,579 million); (2) special *research projects* contributing to economic and social progress (B.F. 250 million); (3) *research in the public sector* (B.F. 1,839 million), covering government research institutes, department programs, and university hospitals; and (4) *international cooperation,* covering scientific cooperation with the other Common Market countries. A study is being carried out by the government to formulate a clearer definition of the objectives of its scientific research activities as a basis for assigning priorities for 1971 funding.

CANADA

9003. Vanterpool, A., "Hindrances to Innovation in Canadian Industry – and How to Remove Them", *Science Forum 16,* v. 3, no. 4, August 1970, pp. 14-18. Innovation – the process by which an invention or idea is translated into the economy – is analyzed, and some barriers to innovation in Canada are discussed. The nine stages of successful technological innovation are presented: the idea, research, development, market analysis, design, tooling up,

manufacturing startup, marketing, and profit taking. It is pointed out that 90 percent of the capital cost is in the last six stages, while the scientist is usually concerned with only the first three. "Anticipation of profits is the driving force behind most innovation." Many of the requirements for technological advances already exist in Canada (e.g., extensive research activities and an ample supply of scientifically, technologically, and managerially capable people). However, the writer cites several major hindrances to innovation in Canada and devotes the bulk of his article to discussing them. One is the lack of interest and business acumen in the exploitation of their own work by Canadian university and government scientists. A second is the unavailability of organized venture capital. He calls for the government of Canada to set "attainable and widely accepted national goals" and "to create and maintain a business, taxation, and cultural environment in which innovation can thrive".

9004. "Doing More with Less", *Nature*, v. 227, no. 5264, 19 September 1970, p. 1188. This article points out that the Canadian National Research Council (NRC) supported university research and industrial research in FY 1970 to the tune of $65 million and $6.3 million, respectively, out of a total budget of $132.7 million. It then states that the NRC is reassessing its priorities, with guidance from the Science Council of Canada, with an eye toward getting the greatest benefit from its limited funds. Existing policies are being reviewed and long-range plans drawn up by a selected committee of scientists, engineers, and economists. The new policies are expected to lean toward more sponsorship of applied research and promotion of improved relationships between the universities and industry.

9005. "Division on Scientific Relations", *Science Policy News*, v. 2, no. 1, July 1970, p. 7. "A new Division within the [Canadian] Department for External Affairs has been set up with the following departmental responsibilities: (a) matters in the category of 'general science' and activities and programmes predominantly scientific in nature (programmes essentially institutional in nature related to the United Nations would be excluded); (b) the conduct of scientific relations with other countries and international organizations, including the negotiation of agreements concerning scientific and technological matters; (c) departmental liaison with the Science Secretariat and other government departments and agencies with scientific interests; (d) matters relating to the human environment (including water and air pollution matters and Arctic and Maritime scientific co-operation); (e) advice on scientific questions with foreign policy implications, whether or not now handled by the Department; (f) official scientific representation abroad."

9006. "Information Board Appointed", *Science Policy News*, v. 2, no. 2, September 1970, p. 20. "The National Research Council [of

Canada] has appointed a 20-member Advisory Board on Scientific and Technological Information to formulate policy guidelines for the continuing development of a national Scientific and Technological Information (STI) system. The announcement follows a decision of the Federal Government, based on recommendations made by the Science council, to designate NRC to develop, under the general direction of the National Librarian and in co-operation with existing informational organisations, an STI system encompassing the natural sciences and engineering."

9007. Dalyell, T., "The Growing Surplus of Canadian PhDs", *New Scientist,* v. 47, no. 717, p. 484. The excess of supply over demand for PhD's in Canada is discussed. The situation is attributed to (1) reduced recruiting of PhD's by university and government research laboratories as a result of tight budgets; (2) very little use of PhD's by Canadian industry, because the laboratories of the large international companies are mostly in the U.S.; and (3) a "flood" of PhD's from the U.S. applying for jobs in Canada because of job shortages in the U.S. or to escape the draft. Proposed solutions are "better forecasting of requirements" (and presumably tailoring university enrollments to projected needs), and increased use of PhD's by industry (which will involve educating both industry and the PhD to adapt to each other's needs).

9008. "Canada to Take Part in NASA's Earth Resources Satellite Program", *Science Forum 16,* v. 3, no. 4, August 1970, p. 29. "Canada intends to participate in the U.S. Earth Resources Technology Satellite Program (ERTS). Discussions have been going on between the Department of Energy, Mines and Resources and the National Aeronautics and Space Administration, and a joint agreement is expected to be concluded later this year. The first ERTS satellite is due to be launched in 1972. It will contain remote sensing equipment that will transmit data to earth stations to be stored and assembled into information about resources such as crops, minerals, and water supplies. The information will enable better management of the resources. Canada's participation will involve setting up a ground telemetry station, a signal-processing centre, and a data handling and distribution centre. These facilities will receive signals from the satellite while it is over Canadian territory and convert it to usable form for Canadian scientists and agencies."

FRANCE

9009. "Reorganization of Ministry of Industry", *Science Policy News,* v. 2, no. 1, July 1970, p. 7. Changes in the organization of the French Ministry of Industrial and Scientific Development are described. The reorganization follows many of the suggestions of a management-

consultant firm which surveyed about 600 Ministry officials and 200 manufacturers representing all sectors of industry. There are still 11 Directorates, but several have been dropped (Mines and Miscellaneous Industries, and Textiles) and others added. The new lineup of Directorates is (1) Studies and Programs (replacing Industrial Policy); (2) Scientific and Technical Research (new); (3) Data Processing (new); (4) Iron and Steel Industries; (5) Mechanical Engineering and Electronics; (6) Chemical and Textile Industries; (7) National and Energy Undertakings; (8) Fuel; (9) Mines, Technology and Industrial Environment; (10) Craft Industries; and (11) Personnel. Another important change is "the creation of a Conseil des Directeurs, to ensure co-ordination of the work of senior officials".

9010. "Fight Against Pollution", *Science Policy News,* **v. 2, no. 2, September 1970, p. 20.** "The [French] Government is working towards an autonomous budget for environmental affairs. Policy will be directed by a High Commission for Environment to be set up. It will consist of nine members representing the central government departments, and nine specially qualified private persons . . . Among 100 measures to be enacted are the following: A ban on the use of detergents non-bio-degradable at 80 per cent, orders concerning the control of noise, the collection and treatment of refuse, the disposal of abandoned motor vehicles, the pollution of sea-water, smoke control (to be enforced in Lyons, after Paris), the purifying of the river Vire in Normandy, the control of pollution arising from the dust from cement works, the systematic cleansing of the beaches along the coasts of Languedoc-Roussillon and Aquitaine, the planning of the experimental town of Vaudreuil (25 kilometres from Rouen), the installation of pollution-measuring equipment in the Fos area near Marseilles. The Government will provide nearly a million francs for the opening up in 1970-71 of new paths in regional nature parks; other plans include the creation of a bird sanctuary on the Island of Ré and of a number of nature parks, an inventory of natural sites and of underground water supplies, the setting up in Provence in 1970-71 of a European Centre on Environment."

9011. Fink, D. E., "French Assembly Votes Defense Budget", *Aviation Week & Space Technology,* **v. 93, no. 16, 19 October 1970, pp. 18-19.** Allocations under a defense budget of $30.65 billion, approved by the French National Assembly for the quintennium 1971-75, are delineated. The budget calls for continued development of advanced nuclear weapons, modernization of France's conventional arsenal, and operating economies in the form of reductions in manpower. Appropriations are about equally divided between procurement of equipment and facilities ($15 billion) and operations ($15.65 billion), with authorization to commit an additional $2 billion from post-1975 budgets. Some specific 5-year budgets for development and

procurement are (1) for strategic nuclear weapons, $10.15 billion; (2) for tactical nuclear weapons, $992 million; and (3) for conventional armaments for the three services, $18.70 billion. Allocation of over one-third of the total defense budget to nuclear-weapons development and procurement was criticized by military officials "as an over-emphasis on a global strike force at the expense of conventional forces, which they feel will play a more critical role in the defense of France". Failure to produce a French strike fighter plane because of the shortage of development funds is causing concern in both the air force and French industry that France will be far behind the U.S. and the rest of Europe both operationally and in the world market.

9012. "French Space Budget Increased 23%", *Aviation Week & Space Technology*, v. 93, no. 18, 2 November 1970, p. 17. "French national space agency (CNES) will receive $132.7 million for operations and program development in 1971, $28 million below its original request. The budget represents a 23% increase in program funding levels over 1970, when the budget was cut to about $100 million. The biggest program funding increase is in the international area, and covers France's increased commitment to the European Launcher Development Organization (ELDO) for completion of the Europa 2 launch vehicle. The international budget of $35.4 million is 77% higher than in 1970. Additional funds will go to Europa 3 development and possibly toward participation in NASA's post-Apollo program. The national space program budget was increased 6% to $70.3 million. The national budget covers those satellite programs CNES does by itself or on a bilateral basis with other countries. The remaining $27 million in the budget covers operational costs for the year. The budget will enable CNES to continue its major projects currently underway. Studies of cooperative programs with the U.S., such as Meteosat and an air navigation satellite, also will continue. Still in question is whether the budget allows sufficient money both for supporting Europa 3 development and participating in NASA's post-Apollo program."

INDIA

9013. Ghaswala, S. K., "India's Nuclear Nectar", *Technology Review*, v. 73, no. 1, October/November 1970, pp. 12-13. This report describes the $1.9 billion, ten-year plan proposed by India's Atomic Energy Commission Chairman V. Sarabhai for nuclear development and power enhancement. India's shortcomings (high population density, high birth rate, high illiteracy, low-yield farming methods, and widespread hunger) are pointed out. On the other hand, it is the most advanced of the developing nations in the extent and quality of dams, irrigation canals, railroads, national research laboratories, deep-sea exploration, space science research, and nuclear technology. Dr.

Sarabhai proposes to add 1700 Mw of nuclear-power-plant capacity to the 1000 Mw already available. He also advocates development of gas centrifuge technology for uranium enrichment, construction of a 500-Mw fast-breeder reactor, establishment of a large new reactor-research facility, expanded heavy-water production, increased use of radioisotopes, a comprehensive space program, and the establishment of an agro-industrial nuclear complex, very nearly complete details of which have already been drawn up. The latter is not a part of the main ten-year plan, but would require an additional $3.3 billion authorization by Parliament – a "colossal" sum by Indian standards. "The nuclear nectar resulting from all these proposals is both complex and confusing. China's launching of a satellite, the Indian government's decision within a month thereafter to expand its atomic and space program, the possible use of enriched uranium and – last but not least – the vehement demands by a section of the country to make nuclear weapons, are clear indications that India is thrusting itself forcefully into the world's nuclear arena and determined to overcome its backwardness through modern scientific methods."

9014. "Space and Atomic Energy in India", *Nature,* v. 228, no. 5267, 10 October 1970, p. 104. Selected items in the Indian Atomic Energy Commission report *Energy and Space Research: A Profile for the Decade 1970-80* are commented on in this article. It is observed that the space program (under the Department of Atomic Energy) has the "ambitious" goal of launching 1200-kg satellites into earth orbit, with a ten-year budget of $220 million. This will entail the development of a launcher and the satellites themselves, with their guidance systems and onboard computers, as well as the construction of new facilities, so that by 1980, an estimated 7000 people will be involved in space research in India. While the writer questions the reasoning behind such space plans, he condones the plans for developing atomic power. The latter involve the building of natural-uranium reactors to produce plutonium to fuel fast breeders, turning out ^{233}U for the next generation (1985) of (thorium-uranium) breeders which can utilize India's plentiful thorium reserves. The Atomic Energy Commission expects to have 2700 Mw of installed nuclear-power capacity by 1980 (6 percent of the total electrical power in India).

INDONESIA

9015. "Institute of Sciences", *Science Policy News,* v. 2, no. 2, September 1970, p. 21. "Lembaga Ilmu Pengetahuan Indonesia l9lipi0 is a Government body, set up by Presidential decree No. 128, 1967, to provide guidance in scientific and technological research. The chairman, Professor Sarwono Prawitohardjo, reports directly to the President. Its main tasks are: '1. to promote the development of

science and technology in Indonesia for the benefit of mankind in general and the Indonesian people in particular; 2. to search for scientific truth; 3. to make preparation for the establishment of the Indonesian Academy of Sciences.' LIPI advises the Government on the formulation of a national science policy, and administers 10 research institutions and a documentation centre. It is funded exclusively by the Central Government. There is a quarterly publication, *Berita LIPI,* giving mainly scientific news." The Executive Secretary is Dr. Didin S. Sastrapradja. Address: Djaban Teuku Tjhik Ditiso 43, Djakarta.

JAPAN

9016. "Pollution Curbs", *Science Policy News,* **v. 2, no. 1, July 1970, p. 9.** "Local governments are making efforts to curb air pollution and various public hazards by concluding 'Public Hazard Prevention' treaties with enterprises in their areas. They have decided not to permit companies to build new factories and plants unless regulations for the prevention of public hazards are observed. A recent survey by the Home Affairs Ministry shows that 51 cities and villages in 21 prefectures have made such agreements. The content of the agreement varies from one prefecture to another, as well as from industry to industry. These preventive measures began to be taken after the Tokyo Metropolitan Government took the initiative, in October, 1969, with regard to the Tokyo Electric Power Company which was planning to build a new thermal power station. Local governmental bodies have used Tokyo's case to clarify their right to investigate and check factories and other industrial installations. The electric power and heavy chemical industries are the most regulated; oil, paper and iron come next."

NIGERIA

9017. "Science Makes Development Sweet", *Nature,* **v. 227, no. 5263, 12 September 1970, p. 1081.** The bulk of this report on the British Association's September meeting at Durham deals with remarks by a Nigerian professor of anatomy, T.A.I. Grillo. Some of Professor Grillo's quoted views are (1) Nigeria welcomes exchanges of people from developed countries, but if the latter send third-rate university teachers they are "conspicuous"; (2) Nigeria is developing technical institutions for higher education, and is unlikely to revert to the classical universities; (3) Nigeria is concentrating heavily on the development of health services, and will "have a more carefully planned programme of medical research than any in the United States or Britain"; and (4) Nigerians are not willing to accept at face value the advice of outsiders that their population growth rate should be reduced, since they are not convinced that there is a population problem in Africa.

NORWAY

9018. "A New Type of University", *Science Policy News,* v. 2, no. 1, July 1970, p. 10. "To relieve overcrowded universities, [the Norwegian] Parliament has approved a government plan to set up experimentally a new type of university with a two-year course oriented towards subjects with practical applications. The 'regional colleges' (Distriktshöyskole) will not copy the universities (although conditions for admission will be the same), but will develop on their own. They will not do research. The following subjects will be covered: public health and social welfare, data processing, journalism, gastronomy and tourism, shipping and fisheries, town planning and transport. The curricula will be adapted to the economic structures of certain regions. Three such colleges will be set up to begin with (Stavanger, Kristiansand, and Molde); if successful, they will be followed by another nine with 1,500-4,000 places each."

PHILIPPINES

9019. Muriel, A., "Brain Drain in the Philippines: A Case Study", *Bulletin of the Atomic Scientists,* v. 26, no. 7, September 1970, pp. 38-39. This case study delves into the reasons that graduate scientists from underdeveloped countries emigrate to advanced nations. The author, a former physics instructor at the University of the Philippines (U.P.), uses the physics graduates of that university as his study subjects. The U.P. granted its first physics bachelor degrees in 1959, as a result of promotional efforts by an exchange professor from Stanford. The three recipients and all but four of the subsequent physics graduates went to the U.S. and other countries for graduate study. Of these (about 50 from 1959 to 1967), only one has returned permanently to the Philippines. Reasons for leaving are given as poor pay, poor professional opportunities, poor administrators, and dissatisfaction with the government. The author points out that a country in which fewer than 1 percent of the people are involved in industry-related work doesn't really need pure physicists (or chemists or mathematicians). He believes that the government made a mistake in accepting a swimming-pool reactor as a gift because the funds spent for maintenance could have been better spent on more relevant research (like a massive birth control program, studying of the breeding habits of milkfish which provide a million-dollar industry, probing the causes of a mysterious coconut disease, or carrying out coastal surveys).

SOUTH AFRICA

9020. "Public Support for Science", *Nature,* v. 228, no. 5269, 24 October 1970, pp. 310-312. A description of the state of scientific

research and related institutions in South Africa is presented by a correspondent who visited the country under the sponsorship of the South African Council of Scientific and Industrial Research (CSIR). The CSIR has a current annual budget of $113 million, which is roughly half of all research expenditures in the country. Of this, less than $2 million is earmarked for university research, and the rest provides most of the support for 15 discipline-oriented government research institutes scattered throughout the country (with a high concentration in Pretoria). CSIR stipends available for teaching, study, and research in the universities are not very attractive. The CSIR has encouraged full exploitation of natural resources, a balance between fundamental and applied research, concentrated research attention to indigenous problems (e.g., the high incidence of liver and esophageal cancer, special housing needs, mine-worker-capability assessment), and extensive information exchange through symposia and foreign travel. A Scientific Advisory Council has been created within the past year to advise the Prime Minister, the Minister of Planning, and science-oriented government departments. The writer's chief criticism of South Africa's R&D policies is that too small a fraction of the total budget is allowed for university research.

9021. "Universities Between Millstones", *Nature,* v. 228, no. 5269, 24 October 1970, pp. 312-314. Problems of higher education in South Africa are discussed. Particular attention is given to the "separate-development" universities (of which there are four for blacks, one for "coloured people", and one for Indians). Most of these have predominantly white faculties – a consequence of the difficulty of finding qualified nonwhite teachers. The ultimate aim is to staff these institutions completely with people who are racially identical with the students. There is general agreement that funds for university development and research are allocated and administered fairly, but CSIR research grants tend to be rather skimpy (see Abstract 9020). Because of inadequate secondary schools and high university academic standards, the attrition rate by failure of students at some universities is high – particularly in scientific subjects. A major complaint is that the staffs are so overworked by teaching that there is little time for research. In spite of this, high-quality work is going on in chemical separations (Pretoria), desert ecology (Stellenbosch), snake venoms (Western Cape), geochemistry and marine ecology (Cape Town), and geophysics (Witwatersrand).

SWITZERLAND

9022. "Swiss Elaborate Criteria for Support of Research", *Science Policy News,* v. 2, no. 2, September 1970, pp. 14-17. Recommendations for a general science policy for Switzerland, as set forth by the Swiss Science Council in its April bulletin *Politique de la Science,* are

summarized and discussed. Principles underlying a Swiss research policy are presented under five headings: **(1) Fundamental Research** – "generous" Federal support is essential to successful R&D, attracts young scientists, and promotes "outstanding intellectual activity"; **(2) Promotion of Oriented Research** – "it is the duty of government to stimulate, coordinate and subsidize research . . . towards solving the major intellectual, sociological, economic and technical problems affecting the human communities in industrialized countries"; **(3) Educational Research** – Switzerland should "re-think its educational concepts" and develop its secondary schools as well as its universities "to meet its growing needs for graduates"; **(4) Government Aid for Industrial Research** – Government support should be aimed at "raising the country's productivity level and competitive power, [though] the extent of State participation in this action is a problem [that] . . . extends beyond the limited context of science policy" and requires detailed study for each case; and **(5) Need for More Research Workers** – foreign scientists must be allowed to work in Swiss industries where research manpower is short; and the Swiss secondary school system must be enlarged to provide more graduates for long-range needs. The Council endorses the principle of backing centers of excellence heavily in a few fields, though it concludes that priorities should be determined by a fully informed "government, Parliament and the voting public". Criteria for selecting priorities (major fields, centers of gravity within fields, international cooperation in "big science", and evaluation of specific applied-research proposals) are presented and discussed.

UNITED KINGDOM

9023. Wick, G. L., "Changing of the Guard?", *New Scientist,* v. 47, no. 718, 10 September 1970, pp. 532-533. This is a report on events at a recent meeting of the British Association for the Advancement of Science (BA) and one of its subgroups, the British Society for Social Responsibility in Science (BSSRS). Disgusted with BA stodginess, the BSSRS members walked out of the meeting, asserting that "the structure of the BA is too fragmented along specialized disciplines to allow discussion of larger issues, that officials of the BA . . . are too embedded in the establishment to question current scientific trends, and that the BA is financially dependent on industrial corporations which could exercise control over their agenda". The following resolution was adopted by the BSSRS at an unstructured seven-and-a-half-hour teach-in on science and society: "As socially responsible scientists we hereby undertake not to conceal from the public any information about the general nature of our research and about the dangerous uses to which it might be put". These events are indicative of the growing concern in England for the effects of science on society, and some scientists felt that the walkout of the BSSRS group

would have a significant effect on the future of the British Association.

9024. "Science and Technology Reprieved", *Nature*, v. 228, no. 5270, 31 October 1970, p. 401. High points of the "Green Paper" by Mr. William Whitelaw, Leader of the House of Commons, are presented. Of particular interest is the retention of the Select Committee on Science and Technology, whose work it said should be continued. The Procedure Committee had suggested that this was one of the committees that should be scrapped, and that the proposed Expenditure Committee should take over some of its functions. The article also notes that enquiries into the computer industry and the British space-research program will probably be continued and "the investigation of the consequences of population growth in Britain may be scrapped or postponed". It is also noted that the Select Committee on Science and Technology will have a different membership than before, since five of its members were not re-elected.

9025. "Benn's House Dismantled", *Nature*, v. 228, no. 5270, 31 October 1970, pp. 397-398. The new government's White Paper on the reorganization of the central government is reviewed and the major areas of change are described: (1) the old Board of Trade and the Ministry of Technology will be united in a Department of Trade and Industry, and the new Department will take over the function of making industrial policy; (2) the Ministry of Technology for aerospace will be transferred to a new organization, the Ministry of Aviation Supply, which is intended to be a temporary measure (eventually research, development, and procurement will hopefully be integrated within the Department of Defense); and (3) a new Department of Environment will be set up and will unite the Ministries of Housing and Local Government, Public Building and Works, and Transport. Questions are raised as to the future of government laboratories under the new organization, and the article favors "a thorough analysis of the functioning of the defence laboratories". The proposed new Department of Environment is questioned as an addition of doubtful value; and some note is made of the planned central policy review staff of the Cabinet office, which will provide "at least more selfconscious procedure for the review of public expenditure".

9026. "Signs of Stringency", *Nature*, v. 228, no. 5265, 26 September 1970, pp. 1284-1285. The Annual report of the British Science Research Council, highlights of which are presented in this article, shows a decrease in rate of the Council's budget growth over the past 5 years. While the budget has increased 40 percent, a rapidly growing university population makes demands for research and endangers the Council's commitment to its international projects (e.g., CERN and

ELDO). During the 5-year period, the greatest area of change in the Council's spending pattern has been the reduction in percent of the budget spent on research equipment – down to 6.6 percent from 16.2 percent. This was part of the Council's plan to cut back spending on nuclear physics; however, this does conflict with other Council policies. "The policy of selectivity and concentration by means of which attempts are being made to build up centres of research at British universities is creating a need for new and expensive facilities." Current projects and grants are reviewed briefly.

9027. "Cuts in Research Grants", *Nature,* v. 228, no. 5270, 31 October 1970, p. 400. Public expenditure cutbacks announced by the Chancellor of the Exchequer will hit research councils, the Industrial Reorganization Corporation, and social services. The annual rate of growth of public expenditure will be reduced to 2.8 percent per year. The Science Research Council's chairman, Sir Brian Flowers, said that the present growth rate of the SRC budget "is already too small for the Council to support many important areas of research". The cuts will probably affect the government's willingness to support CERN, and reviews are being undertaken to see if some projects might be supported by industry. The Council for Scientific Policy is conducting the review and will report its findings to the Secretary of State for Education and Science.

9028. "NERC Grows On", *Nature,* v. 227, no. 5264, 19 September 1970, p. 1180, and "New Center for NERC", *Nature,* v. 228, no. 5266, 3 October 1970, p. 5. The British Natural Environment Research Council (NERC) reports spending £11.84 million during the past year, a large fraction going to organizations such as Nature Conservancy. £1.84 million went to research grants and training awards, and only £1.25 million to universities. "Considerable evolution" in policy toward postgraduate research support is noted in the report, and there are conditional plans to increase allocation of funds for this purpose. A recently established Institute for Marine Environmental Research will "bring together various projects already in progress in universities and other organizations, under the auspices of NERC". Principal aim of the Institute will be to broaden understanding "of the biological basis of the productivity of the oceans" and to study natural changes and changes brought about by human activity.

9029. "Quiet Before the Storm", *Nature,* v. 228, no. 5269, 24 October 1970, p. 303. The Atomic Energy Authority (AEA) of the U.K. reports favorably on progress toward a fusion reactor by Anglo-Russian scientists working with the Russian Tokamak device. Nevertheless, funds for the project continue to be cut on the basis of "decisions made several years ago, even though, as the report puts it, 'progress fully justifies the maintenance of a strong and viable

program in the United Kingdom' ". The AEA is concerned chiefly with the development of new reactor systems, having spent £43.3 million on these systems last year and £41.3 million the previous year. Both expenditures and the number of AEA personnel dropped last year; the budget dropped by £7 million, while the staff decreased by 1,300 to 30,000, continuing its steady decline from the 1961 peak of 40,000.

9030. Smith, P. J., "Rethinking the 300 GeV Decision", *Science Journal,* v. 6, no. 9, September 1970, pp. 64-65. The author attacks "the reasoning (for want of a better word)" behind British science policy, as exemplified by the decision processes in the 300 GeV accelerator project. He points out that since the original decision not to join this international cooperative project in 1968, "there still have been no discussions about priorities in British science, with or without reference to the 300 GeV machine". Furthermore, he states that the Government has not indicated the basis for its 1968 decision. While the Science Research Council has begun some work on policy and published an outline for physics priorities, "the ways in which the policies were arrived at are still rather obscure". The author puts an appropriate share of the blame on the high-energy physicists for the communications gap between them and the British Government. He closes with a series of questions on the manner of generating decisions, the "obsessive secrecy" in arriving at decisions, and the apparent contempt for scientists displayed by the "politicians of science".

U.S.S.R.

9031. Goldman, M. I., "The Convergence of Environmental Disruption", *Science,* v. 170, no. 3953, 2 October 1970, pp. 37-42. Environmental problems in the U.S.S.R. are catalogued in detail and the political philosophies of the U.S. and Russia are compared from the standpoint of causes and cures of environmental pollution. "It has been assumed that, if all the factories in a society were state-owned, the state would insure that the broader interests of the general public would be protected. . . Soviet officials continue today to make such assumptions." Contrary to this, the author cites a number of "incentives to pollute under socialism": (1) "State officials identify with polluters, not with conservationists, because polluters will increase economic growth and prosperity"; (2) while failure to vote for antipollution measures may defeat a U.S. politician, "no such device for transmitting voting pressure exists at present in the U.S.S.R."; (3) raw materials until recently were treated as free goods in Russia, and this attitude has resulted in very low recovery rates and the discarding of large quantities of salvageable materials; (4) "it is as hard for the Russians as it is for us to include social costs in

factory-pricing calculations,... [and] there are no private property owners to protest the abuse of various resources", and (5) in a state-run economy, "the power of the state to make fundamental changes may be so great that irreversible changes may frequently be inflicted on the environment without anyone's realizing what is happening until it is too late". However, certain features of the socialist system facilitate environmental control: (1) with the power to prevent the production of any product, the Russians can easily withhold ecologically harmful materials, (2) because of low emphasis on consumer goods, the Russians have less waste to discard, (3) "because labor costs are low relative to the price of goods, more emphasis is placed on prolonging the life of various products", (4) the Soviet system facilitates setting aside land for use as natural preserves and enforcement of pollution laws, and (5) extensive use of centrally supplied steam in the U.S.S.R. "makes possible more efficient combustion and better smoke control". The author concludes that "if the study of the environmental disruption in the Soviet Union demonstrates anything, it shows that not private enterprise but industrialization is the primary cause ... [and] that a strong centralized and planned economy has no notable advantages over other economic systems in solving environmental disruption".

9032. "Soviet Problems with Research", *International Science Notes*, Bureau of International Scientific and Technological Affairs, Department of State, Washington, D.C., no. 25, September 1970, pp. 16-17. This is a report on a recent article in *Pravda* which "complains of an excess of holders of advanced degrees and of the fact that dissertations remain unread and unused ... [partly as a] result of special rules ... in the fundamental libraries, where many obstacles are interposed between the dissertation and the reader". It criticizes the method of selection of thesis subjects and the lack of limitations on the number of scientists in institutes. Since "degrees automatically confer higher salaries", the institutes become topheavy with skilled workers and have very little of their budgets left for materials and equipment. The article also cites the need for economic reforms in research administration. Lack of clear pricing regulations makes it possible for research institutes to charge clients substantially more than the cost of the research.

9033. "After Luna 16", *Nature*, v. 228, no. 5266, 3 October 1970, pp. 6-7. "According to Academician B. N. Petrov, the Moon programme is at present conceived in two stages: (1) 'preliminary (reconnaisance) investigations with the aid of automatic spacecraft; (2) subsequent multilateral systematic research and investigation by means of both automatic and piloted craft for the wider use of the achievements obtained for the aims of science and the national economy'." Petrov estimated that a manned mission would cost 20 times as much as

Luna 16, which scooped up moon-rock samples and returned safely to earth. Thus, it appears that Soviet long-range space flight will remain automatically based for some time. A Soviet scientist noted in a *Pravda* interview that automatic spacecraft can operate in radiation belts under dosages that would be dangerous to humans. This led the author to speculate on the likelihood of the Soviets undertaking an extensive study of space radioactivity profiles.

9034. "Back to Nature", *Nature,* v. 228, no. 5270, 31 October 1970, p. 404. "The recent launch of Kosmos 368 comes as an interesting variation in a series of satellites whose payloads have been either unannounced, or which consist of physical experiments. Kosmos 368 is stated to include 'scientific apparatus for testing life support systems for laboratory animals, for the further study of the effect of space flight on living organisms and for the continuation of the investigation of the physical characteristics of space'." This latest approach to the study of weightlessness "may be a preliminary to establishing a manned space station as a base for manned exploration of the Moon or planets".

WEST GERMANY

9035. "The Course of German Science", *International Science Notes,* Bureau of International Scientific and Technological Affairs, Department of State, Washington, D.C., no. 25, September 1970, pp. 10-13. This is a rather detailed account of the growth of science and technology in West Germany (the FRG) from insignificance in 1948 "to a position which in some areas is near preeminence". The greatest acceleration has occurred since 1962, the year the FRG established the Federal Ministry for Scientific Research and took over the support of science. This acceleration is continuing. The FRG and the States jointly finance the German Research Society (DFG) and the 50 institutes of the Max Planck Society (MPG) – $30 million and $35 million, respectively, in 1970 – for research in all fields of science. Three "big science" programs are being promoted by the FRG – atomic energy, space research, and data processing. Atomic energy is farthest along, with six nuclear power stations and a nuclear merchant ship in operation by 1968, a current annual budget of around $375 million for nuclear R&D, and an expected increase in the budget of 50 percent by 1974. The 1970 space research budget is about $92 million, with an expected increase to about $200 million by 1974. The FRG has five major space centers, operated by a unified German aerospace research establishment. The data-processing program is funded at a total of $75 million for the 5 years ending in 1971 ($31.5 million in 1970), with the objective of upgrading Germany's capabilities and applications of automatic data processing. In other areas of industrial technology, FRG industries have

capabilities that are generally comparable with those of U.S. industries.

9036. "Future Trends in German Science", ***International Science Notes,*** **Bureau of International Scientific and Technological Affairs, Department of State, Washington, D.C., no. 25, September 1970, pp. 13-15.** This article picks up where the preceding one (Abstract 9035) leaves off, listing current and planned programs and budgets in science, technology, and education in West Germany (the FRG). These plans reflect Chancellor Brandt's wish to give priority to "the promotion of science and technology, including environmental improvement". The Federal Ministry for Education and Science (formerly Federal Ministry for Scientific Research) has a 1970 budget of about $750 million (36 percent above 1969's), about half of which "is earmarked for education, universities, and support of general scientific research, the other half for the major technological programs, i.e., nuclear research, space research, data processing, and new technologies". Forecasts indicate that this Ministry's budget will increase to $2,250 million by 1974. Specific projects in atomic energy, space, and data processing, along with plans and speculations for international cooperation, are discussed. Some of the items to be promoted under the *New Technologies* program are (1) programs related to problems of society (environmental protection, food, raw materials, transportation, information); (2) R&D in future-oriented key technologies of importance to the FRG's general technological capability; (3) R&D in fields where German industry is lagging behind competitors in foreign countries because of vigorous government support abroad; (4) promising industrial research that is too risky or expensive for industry to back; and (5) further development of new sciences and techniques arising from publicly financed R&D.

9037. "Three Principles of German Science Policy", ***Science Policy News,*** **v. 2, no. 1, July 1970, p. 9.** Guidelines for the new West German Government's policy for science and education were summed up in the following three principles presented in a speech by Professor Leussink, Federal Minister for Education and Science: (1) *an integrated policy for science and education* – science policy must aim at producing not only economic, social, and cultural progress, but also an educational system to train manpower "to shape this scientific and technological world through critical thought and responsible action"; (2) *an integrated policy for science and technology* – science policy must, through fostering appropriate scientific and technical curricula in schools, be directed toward economic growth and practical applications of research results to improving the quality of life as well as toward producing consumer goods; and (3) *science policy in the context of international science policy* – science policy must provide not only for international

cooperation in costly projects and in programs that cross national boundaries, but also for furthering the Country's foreign-policy objectives (e.g., the FRG's European policy directed toward enhancing Western Europe's cultural attraction, maintaining Western Europe's "position of an equal partner" in world affairs, and strengthening the solidarity and economic position of the European Economic Community).

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